S 0049667

ENGINEERING CHANGE NOTICE

1. ECN 643820

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	James N. Strode, Models and Inventory, R2-11, 373-1280	[] Yes [X] No	08/18/98
	6. Project Title/No./Work Order No.	7. Bldg./Sys./Fac. No.	8. Approval Designator
	Operational Waste Volume Project	N/A	N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.)	10. Related ECN No(s).	11. Related PO No.
	HNF-SD-WM-ER-029, Rev. 23	See Block 12	N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change — 13b. Design Baseline Document? [] Yes [X] No

This document updates Revision 23 by incorporating changed facility schedule assumptions, as well as waste generation rates and volumes which have occurred since the publication of Revision 23. All the values in this document will be updated several times per year.

Continued from Block 10: ECN-603360, ECN-189210, ECN-166505, ECN-606102, ECN-631389, and ECN-635540.

14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

See Block 13a above.

15. Distribution (include name, MSIN, and no. of copies)

See attached distribution.

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ENGINEERING CHANGE NOTICE

1. ECN (Use no. from pg. 1) ECN-643820

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request.	[]		[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

21. Approvals

Signature	Date	Signature	Date
Design Authority		Design Agent	
Cog. Eng. J.N.Strode/V.C. Boyles JNS/VC Boyles	8/19/98	PE	
Cog. Mgr. K.M. Hodgson K.M. Hodgson	8/19/98	QA	
QA		Safety	
Safety		Design	
Environ.		Environ.	
Other J.G. Kristofzski, Process Engineering	8/20/98	Other	
D. I. Allen, Tank Waste Operations Dale Allen	8/19/98		
R.R. Bloom, Liquid Waste Processing Facilities For RR Bloom	8/19/98	DEPARTMENT OF ENERGY	
		Signature or a Control Number that tracks the Approval Signature	
B.G. Erlandson, Environmental for	8/19/98	ADDITIONAL	
R. L. Treat, Tank Waste Retrieval R.L. Treat	8/19/98		

Operation Waste Volume Projection

J.N. Strode/V.C. Boyles
Lockheed Martin Hanford, Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: ECN-643820 UC: 2070
Org Code: 7A140 Charge Code: N16C1
B&R Code: EW 3120074 Total Pages: 93

Key Words: Waste Volume Projection, Tank Space Management Board, Waste Volume Reduction, Double-Shell Tank, Evaporator, LERF

Abstract: Waste receipts to the double-shell tank system are analyzed and wastes through the year 2015 are projected based on generation trends of the past 12 months. A computer simulation of site operations is performed, which results in projections of tank fill schedules, tank transfers, evaporator operations, tank retrieval, and aging waste tank usage.

This projection incorporates current budget planning and the clean-up schedule of the Tri-Party Agreement. Assumptions were current as of July, 1998.

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Release Approval   AUG 20 1998 Date   Release Stamp

Approved for Public Release

RECORD OF REVISION

(1) Document Number: SD-WM-ER-029

Page 2

(2) Title
Operational Waste Volume Projection

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
	(7) Previous revisions have been done on the now obsolete IRACCR and Record of Revision forms.		
21 RS	Incorporated per ECN 606102	GM Koreski JN Strode	WB Barton 9/22/9
22 ~~RS~~	Incorporated per ECN 631389	JN Strode GM Koreski	WB Barton 9/18/96
23 RS	Incorporate per ECN-635540.	J.N. Strode V.C. Boyles	K.M. Hodgson 8/19/97
24 RS	Incorporate per ECN-643820.	J.N. Strode V.C. Boyles	K.M. Hodgson 8/19/98

A-7320-005 (08/91) WEF168

OPERATIONAL WASTE VOLUME PROJECTION

JULY 1998

Prepared by

J. N. Strode
V. C. Boyles

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APPENDICES

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1.0 SUMMARY

The Operational Waste Volume Projection (OWVP) presents a basis for evaluating future Double-Shell Tank (DST) space through FY 2015. This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional double-shell tanks. This document presents the results of three distinct projections cases. Operating assumptions for the three cases were established prior to July 1998. Operating assumptions and results are summarized below:

- o Case 1 (TPA Compliant) presents projected DST needs based on TPA milestones, TWRS program planning, and the current operational assumptions. The TPA Compliant Case exceeds available space by one tank in FY 2001, by up to two tanks in FY 2005-2007, and by up to seven tanks by FY 2012. Options to reduce the tank space shortage in FY 2012 and beyond include adjusting the SST solids retrieval schedule to match available space or increasing the Phase 1B or Phase 2 processing rates. Please see Section 5.1 for more details.

- o Case 2 presents projected DST needs based on the assumptions received for the May 27, 1998 Alternative Case (DeLozier, 1998) without SST solids retrieval. The May 27, 1998 Alternative Case delayed waste treatment to FY 2006. However, Case 2 delivers additional feed beyond the minimum order quantities through FY 2016. This projection was designed to identify the space available for SST solids retrieval. Please see Section 5.2 for more details.

- o Case 3 was based on the same assumptions as Case 2 and includes TPA Compliant SST solids retrieval schedule from Case 1. As expected, this projection exceeds available space by FY 2004 due to SST solids retrieval. The tank space needs for this projection clearly show that SST solids retrieval should not be started until approximately FY 2007 and that the rate of retrieval should be reduced to match the slower waste treatment schedule built into this projection.

A comparison of the projected tank space needs required for the three projection cases is depicted in Figure 1. Key assumptions for the three projection cases are summarized in Table 1. Differences in assumptions have been highlighted. Detailed assumptions and space saving alternatives are presented later in this document. A brief summary of the risks associated with these projections is provided in Table 2. Additional information and references for Table 2 can be found later in this document by referring to the section listed under comments. At a minimum, this DST space forecast will be updated annually with the latest information available regarding the estimated volume of waste requiring storage in the DSTs.

Areas Requiring Management Consideration

Facility waste minimization requirements initiated by the Tank Space Management Board (TSMB) helped to guarantee tank space availability prior to the 242-A Evaporator restart in FY 1994. However, considering the possibility of future tank space shortages, the Terminal Clean-out (TCO) and monthly waste generations will continually need to be minimized. The DST Waste Inventory Control Group is a group which meets on a monthly basis to review projected waste generations, waste transfers, and tank configuration control. Issues that cannot be resolved by this group will be elevated to the Feed Process Senior Management board. Should a tank space shortage occur during the projection period (Figure 1), the shortage could be solved using a combination of the following actions (see Section 6.0 for a more complete listing):

- delay the Single-Shell Tank (SST) interim stabilization
- delay the SST solids retrieval
- accelerate processing and vitrification of waste
- establish Phase 2 contract terms for privatization to require rates of retrieval and processing equivalent to TPA rates
- construct new double-shell tanks

Approximately 6-8 years are required to build additional double-shell tanks (DSTs). The TPA Compliant Case presented in this document projects that tank space needs will be at or exceed the available space during the FY 2005-2007 and FY 2011-2014 timeframes. With the proposed delay in the treatment schedule for LAW and HLW, there will be a definite DST space problem if the SST retrieval schedule does not change. There is still time to resolve the tank space shortage issue and as the new RL and TPA agreements are better understood, a new OWVP projection will be completed. In addition, a number of space saving options are presented to rectify the tank space shortage. This document is recommending that further review of the final privatization contract be conducted and the space saving options, the budget, and the projection assumptions be monitored closely over the next year. In the event additional tanks are needed as a result of the proposed privatization schedule, there will be adequate time next year to prepare for the additional tanks.

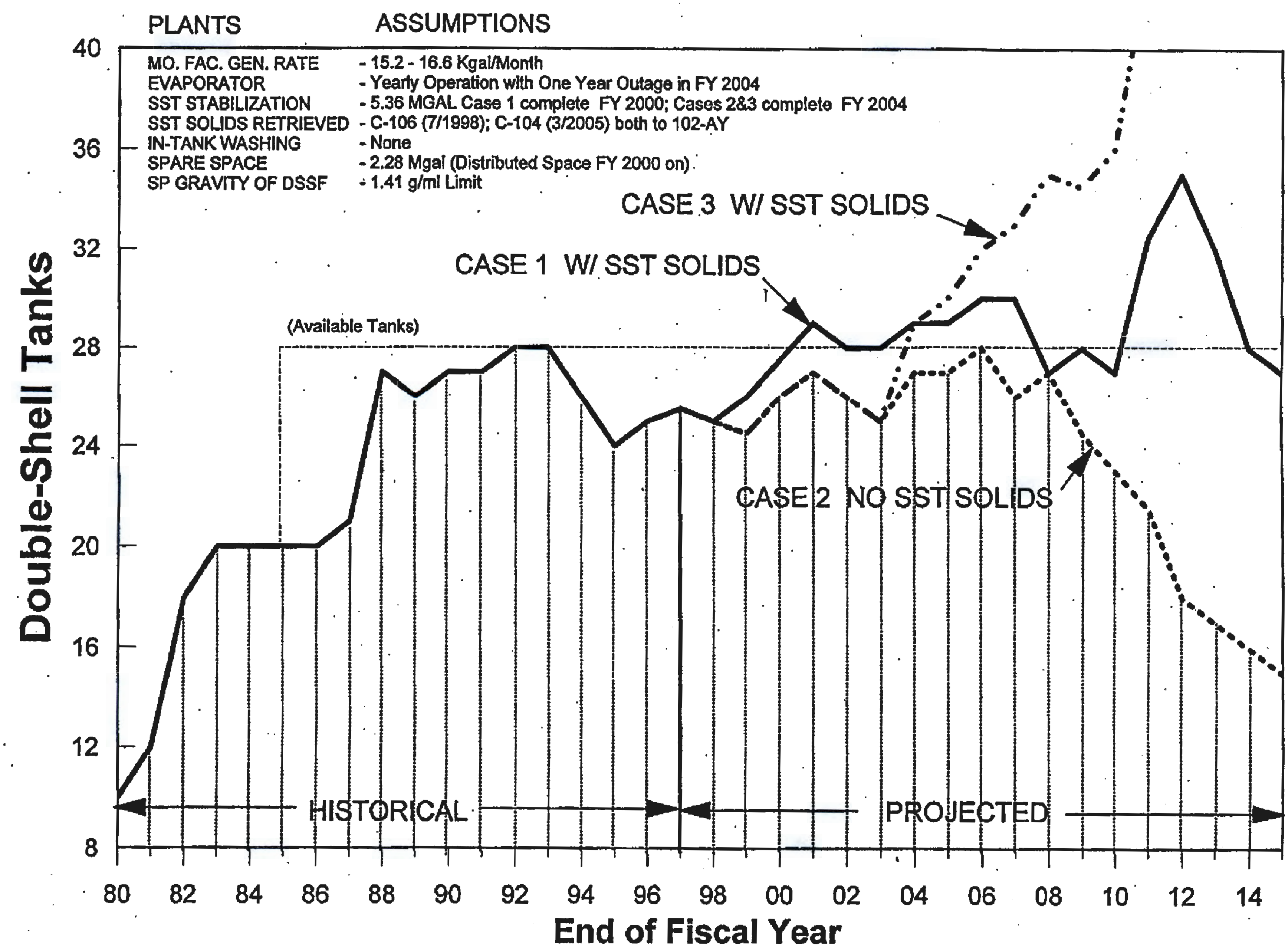

Figure 1. Comparison of Tank Requirements for 7/98 Projection Cases

OF1

Table 1. Summary of Assumptions For the 1998 Projection Cases (references in Sect. 3)

Facility or Project	Case 1 Assumptions	Case 2 Assumptions	Case 3 Assumptions
Total Monthly Facility Generations	15.2-16.6 Kgal/month	15.2-16.6 Kgal/month	15.2-16.6 Kgal/month
PUREX Misc After TCO Completed	5 Kgal/year DN	5 Kgal/year DN	5 Kgal/year DN
B Plant TCO	TCO Complete FY 1998 (103 Kgal)	TCO Complete FY 1998 (103 Kgal)	TCO Complete FY 1998 (103 Kgal)
100N Area TCO	Wastes sent to ERDF	Wastes sent to ERDF	Wastes sent to ERDF
100K Area TCO	TCO FY 2003 (0.35 Mgal DN)	TCO FY 2003 (0.35 Mgal DN)	TCO FY 2003 (0.35 Mgal DN)
105 F & H Basin Cleanout	TCO FY00-05 (0.24 Mgal DN)	TCO FY00-05 (0.24 Mgal DN)	TCO FY00-05 (0.24 Mgal DN)
Evaporator Operation Outage	Operates as required through 2015 except for one year outage in FY 2004	Operates as required through 2015 except for one year outage in FY 2004	Operates as required through 2015 except for one year outage in FY 2004
Liquid Effluent Treatment Facility Rate (Mgal/Year)	50	50	50
SST Stabilization Porosity Saltcake/Sludge Complexed SWL Volume Pumped	 50%/21% 1.64 Mgal ~5.36 Mgal (1998-2000)	 50%/21% 1.64 Mgal ~5.36 Mgal (1998-2004)	 50%/21% 1.64 Mgal ~5.36 Mgal (1998-2004)
PFP Stabilization	27 Kgal (FY 1998-2006)	27 Kgal (FY 1998-2006)	27 Kgal (FY 1998-2006)
Tank 101-SY Processing Dilution	No Dilution until 1/2007	No Dilution until 1/2008	No Dilution until 1/2008
Tank 103-SY Processing Dilution	No Dilution until 5/2007	No Dilution until 4/2010	No Dilution until 4/2010
SST Solids Retrieval 106-C solids (start; receiver tank) SST Solids Retrieval Start Rate SST Waste Retrieval Complete SST Site Closure Complete	TPA Compliant 9/1998; Tank 102-AY 12/2003 2.8 Mgal in FY 2004-2005; 3.6 Mgal in FY 2006-2007; FY 2018 FY 2024	No SST Solids Retrieval--determine space available.	TPA Complaint 9/1998; Tank 102-AY 12/2003 2.8 Mgal in FY 2004-2005; 3.6 Mgal in FY 2006-2007; FY 2018 FY 2024
Phase 1B Privatization Processing startup	06/2002	05/2006	05/2006
LAW Processing Rate (Mgal/Yr) Phase 1 Extension	2.03 in 1st Year (6/2002-5/2003) 2.22 in 2nd Year Yes - Through Maximum Order Quantities	~2.0 in 1st Year (5/2006-4/2007) ~2.0 in 2nd Year Yes - Through FY 2016	~2.0 in 1st Year (5/2006-4/2007) ~2.0 in 2nd Year Yes - Through FY 2016
LAW Vendor Feed Tanks LAW Intermediate Feed Staging Tanks Sr/TRU & Entrained Solids Receipt Tank Aging Waste Supernate Receipt Tank	2 2 1 0	1 2 1 1	1 2 1 1
Phase 2 Privatization Maximum Processing Rate,Mgal/Yr @ 7M Na Maximum Processing Rate,Mgal/Yr @ 5M Na HLW Vitrification startup HLW Return Tanks	2011 17.2 24.1 2013 3	Not included by end of FY 2015	Not included by end of FY 2015
In-Tank Washing (FY 1998-2004) Consolidate NCAW solids Consolidate NCAW supernates to	Case 8 Modified (Sect. 3.17) No 101-AY + 1 DST	Not included. Vendor washes NCAW solids.	Not included. Vendor washes NCAW solids.
Evaporation Limit for Wastes--SpG	1.41	1.41	1.41
Spare Space	2.28	2.28	2.28
Contingency Tank	None	None	None
Loss of DST Space	None	None	None

Table 2. Risk Assessment Summary for Waste Volume Projections

RISK ASSESSMENT SUMMARY FOR WASTE VOLUME PROJECTIONS									
Technical/Program Basis for Waste Volume Projections	Confidence of Basis Being Accurate			Waste Volume Impact if Wrong			Consequence if Assumption Wrong		COMMENTS
	HIGH	MED	LO	MAJOR	MINOR	QUANTITY	MAJOR	MINIMAL	
Remaining SWL pumping volume is ~5.36 Mgal without flush or dilution		X		X		Dependent on magnitude of change	X		Delay TPA milestones; Large concentrated volume; see Section 3.8; Could prevent initial feed staging for Phase 1 LAW Privatization
CC waste will not solubilize the TRU sludge in Tank 102-SY		X		X		Dependent on magnitude of change	X		Could delay SWL pumping TPA milestones; see Section 3.8
242-A Evaporator available with one outage in FY 2004	X			X		Dependent on magnitude of change	X		Tank Space Projections based on concentrated volumes; see Section 3.2
Evaporation limit for new DSSF will be SpG of 1.41		X		X		Dependent on magnitude of change	X		Reduction in SpG could be required by safety;Section 3.2
Facility generations will not exceed TPA Compliant Case levels		X			X	Dependent on magnitude of change		X	Small concentrated volume; could delay site cleanup; see Section 3.0
Facility TCO volumes: 100 Areas <0.6 Mgal		X			X	Dependent on magnitude of change		X	Could delay site cleanup; see Section 3.0
No loss of DST space	X			X		1 mgal/tank	X		see Section 3.22
LAW Phase 1 treatment starts FY02; ~2.2 Mgal/yr			X	X		Dependent on magnitude of change	X		Could delay SST solids retrieval (TPA); Section 3.17
LAW Phase 2 treatment starts FY11; 24.1 Mgal/yr			X	X		Dependent on magnitude of change	X		Could delay SST solids retrieval (TPA); Section 3.18
Crossite transfer lines are available	X			X		Dependent on magnitude of change	X		Could delay SWL pumping TPA milestones and/or site cleanup; see Section 3.11
Use Grout in emergencies to free up 2-3 Mgal of space		X		X		Dependent on magnitude of change	X		DOE and public acceptance unlikely; see Sections 3.3 & 5.1
No volume set aside for upsets or new streams		X			X	Dependent on magnitude of change	X		Consequences depend on volume, composition, and timing see Section 3.20

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2.0 INTRODUCTION

2.1 Purpose

The purpose of the Operational Waste Volume Projection (OWVP) is to present a basis for evaluating future Double-Shell Tank (DST) needs to meet Tri-Party Agreement (TPA) Milestones M-46-00 and M-46-01. Milestone M-46-00 states that an OWVP report shall be prepared and issued annually evaluating DST needs. Milestone M-46-01 requires the Tank Waste Remediation System (TWRS), to review and recommend whether or not to build additional DSTs on an annual basis.

This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional DSTs. This document presents the results of three projected cases which represent varying degrees of tank space demands. All projected cases incorporate the "privatization" of waste treatment and disposal. The term "privatization" refers to the DOE strategy for phased retrieval and treatment of Hanford tank wastes which would use private contractors to design, permit, build, operate, and deactivate the facilities for waste treatment and immobilization (DOE, 1995). Case 1 is intended to present tank space needs based on all TPA milestones, TWRS program planning, and current operational assumptions. Cases 2 and 3 have a later starting date for treatment than Case 1. Case 2 does not include single-shell (SST) solids retrieval. Operating assumptions for the three cases were established prior to July 1998. Need dates for new DST construction, tank retrievals, facility schedules, waste generation reductions, conflicts in meeting TPA milestones (WDOE, 1994; WHC, 1996a; WHC, 1996b), and funding priorities can then be reviewed in relation to tank space availability.

2.2 Methodology

The process followed in preparing an OWVP is shown in Figure 2, below.

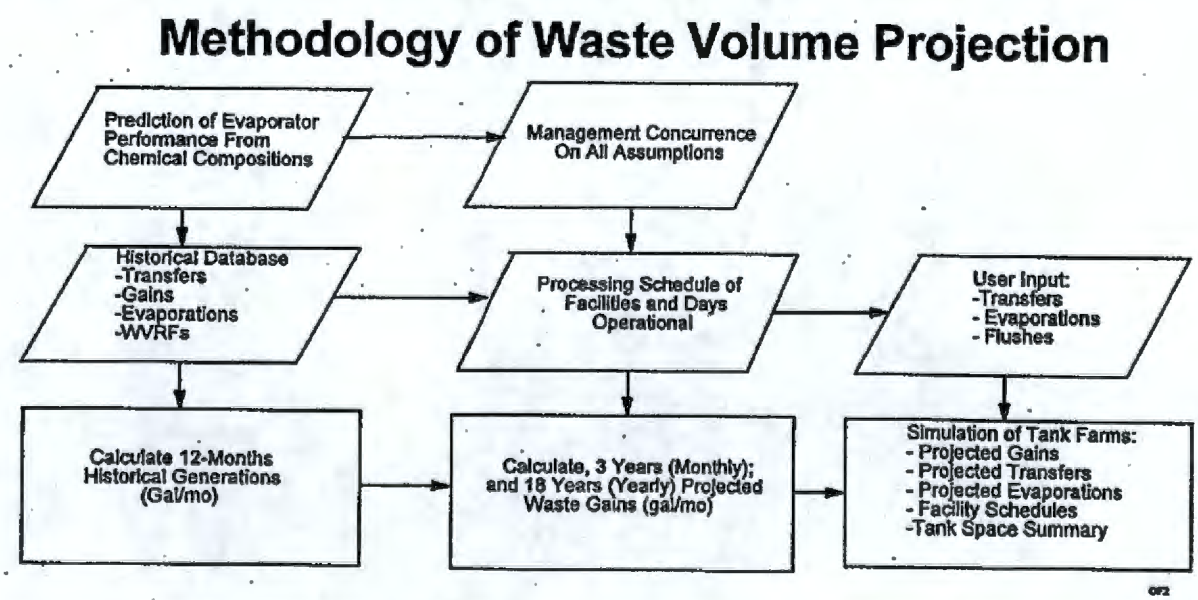


Figure 2. Methodology of the OWVP

The process of updating the OWVP begins with the request for updated facility or project "assumptions" from each of the operating facilities and projects that will contribute waste to DST inventory. The term "assumption" in this document refers to engineering inputs or bases supplied by the facilities based on their future operational plans (determined by budget, DOE directive, TPA milestones, etc.). Typical assumptions include operating schedules, waste generation rates, stream compositions, modes of operation, etc. The operating facilities and projects provide estimates of volume, composition, and radionuclide content data for each distinct waste stream exiting the facility. In addition to the projected facility waste generation rates, the processing schedules of each of the plants are factored into the projection. For the Plutonium-Uranium Extraction (PUREX) facility, B Plant, and 100 Area facilities the projected volumes of waste generated from Terminal Clean-out (TCO) are estimated and entered. For the Plutonium Finishing Plant (PFP), 300 Area, 400 Area, and Tank Farms, monthly waste generations are entered from facility inputs and/or actual observed generation rates. These projected waste generation rates and plant schedules are used to project waste volumes that each plant will be producing per month or year. The composition data is used to calculate Waste Volume Reduction Factors (WVRFs) and to determine waste segregation requirements (due to chemical, radionuclide, or heat content). The WVRF (Riley, 1988) is defined as the percent of water (by volume) that can be removed from a waste stream to achieve a certain interim waste form such as double-shell slurry feed. From the facility assumptions, a matrix of basic assumptions for the three cases to be incorporated into the OWVP projections were prepared and presented to Hanford contractor management and program office for approval.

Once the projection cases have been approved, the database of past waste gains, transfers, and evaporations is updated with data from the most recent months of Tank Farm operations. The early years of the projection are simulated in more detail than the later years. In the first period of the projection, monthly waste volumes are predicted. For the last years of the projection, yearly waste volumes are predicted.

The processing sequence in the simulation is designed to model the actual activities in the tank farms. After a dilute receiver tank is filled with waste, the contents are transferred to an available holding tank, sampled (sampling and analysis require four months), and transferred to the 242-A Evaporator feed tank (Tank 241-AW-102[1]) for evaporation. After dilute waste is concentrated in the 242-A Evaporator, it is sent to a slurry receiver tank (Tank 106-AW) as Double-Shell Slurry Feed (DSSF) which will eventually be disposed of through the Low-Activity Waste (LAW) processing and vitrification process.

The processing sequence for the Neutralized Current Acid Waste (NCAW) solids is for the solids to be washed in-tank and then immobilized in the High-Level Waste (HLW) vitrification plant. The separated supernates and washes will be pretreated to form high-level and low-activity waste streams. The HLW vitrification facility will incorporate high-level and transuranic (TRU) wastes into a glass matrix for disposal. The low-activity waste stream will be sent to LAW vitrification for final disposal.

[1] Waste tanks are hereafter referred to in an abbreviated form; for example, Tank 102-AW.

3.0 GENERAL FACILITY DESCRIPTIONS AND ASSUMPTIONS

A brief description of the facilities and projects pertinent to the Case 1 projection are listed in the following section. Assumptions unique to the Case 2 and Case 3 projections are described in Section 4. Facility operating dates, waste generation volumes, WVRFs, flushes, and other pertinent assumptions are described. This information has been summarized for each of the three cases in Table 11, which is included at the end of this section. The spreadsheet for the Case 1 projection (Section 5.1) lists the waste generations for each year for facilities that presented a range of waste generation rates (e.g., T Plant varied from 1.4 to 2.7 Kgal/month during the period FY 1998-2015).

This year, there has been an attempt to totally integrate the OWVP and Disposal Engineering assumptions and the integration is good through the end of Phase 1 (circa FY 2011). Phase 1 processing assumptions, tank usage, and the order of processing were furnished by Disposal Engineering (Kirkbride, 1997) and are consistent between the two projects. The SST solids schedules and Phase 2 assumptions used in this document were drafts furnished by Disposal Engineering. Phase 2 assumptions furnished by Disposal Engineering consisted of waste workoff rates (Wittman, 1997a and 1997b). The HLW return refers to the entrained solids returned to Tank 107-AP from the private contractors during Phase 1. Since the detailed amount and nature of this stream were not available, an entire DST was allocated to their storage. This stream includes Sr/TRU for Case 1, but only entrained solids for Cases 2 and 3. The OWVP and Disposal Engineering assumptions will be further integrated in next year's OWVP document.

3.1 B Plant/WESF

B Plant was constructed in 1945 to recover plutonium by the bismuth phosphate process. The facility was refurbished in 1967 to recover cesium and strontium byproducts from the high level waste tanks (Simmons, 1998). In 1974, the Waste Encapsulation and Storage Facility (WESF), was constructed on the west end of B Plant to support B Plant's mission. WESF's original mission was to encapsulate, cool, store, and monitor the high heat generating cesium and strontium capsules. The byproduct recovery mission was completed in FY 1984 after which B Plant was considered for waste processing. B Plant is no longer considered a viable option for processing of Hanford tank waste and is presently transitioning to shutdown in FY 1998.

B Plant discharges a low-level miscellaneous waste stream (dilute non-complexed waste) resulting from cell drainage, vessel clean-out, condensate collection, etc. Future TCO activities will generate wastes that can be separated into three categories (Smith, 1994): 1) aqueous phase waste generated during organic solvent removal (may be complexed waste); 2) dilute non-complexed (DN) waste; and 3) uncharacterized waste resulting from vessel flushing (assumed to be DN waste). Uncharacterized wastes will be characterized when they are produced.

For all projection cases, it was assumed that plant stabilization would be completed in 1998 and that the remaining volume of waste would be 103 Kgal (Simmons, 1998). When B Plant has completed TCO, WESF will continue to generate approximately 5 Kgal/year of waste from 1998-2028. The WVRF to evaporate either B Plant miscellaneous or TCO waste to DSSF is 99% (Sederburg, 1995). No flushes are anticipated for B Plant miscellaneous or TCO streams based on their dilute nature and lack of solids.

All three cases in this document were based on the waste generations described above. The upper waste rate supplied by B Plant engineers (Simmons, 1998) would have increased the remaining B Plant TCO volume from 103 Kgal to 140 Kgal.

3.2 242-A Evaporator and LERF

The 242-A Evaporator was restarted on April 15, 1994. To understand the projection model for the 242-A Evaporator, it is necessary to understand the waste flow during evaporator operation and the simulation model. Waste from the dilute holding tanks are transferred into the evaporator feed tank (Tank 102-AW). Waste in the feed tank is then transferred to the 242-A Evaporator for boil-down. In the evaporator operation, four to six months is required for wastes to be sampled and analyzed per Evaporator DQO requirements (Von Bargen, 1995) before they can be evaporated.

- This projection model assumed that the 242-A Evaporator would operate in a "Linked Run" process mode (Guthrie, 1993). A "Linked Run" is a continuous operation of the 242-A Evaporator, made possible by simultaneously transferring from the DST's to the Evaporator feed tank (Tank 102-AW).

- A period of four months is required from the time a holding tank is filled with dilute wastes before the waste can be evaporated. This period allows time for sampling, analysis, documentation, and facility preparation (Guthrie, 1997b).

- In the computer simulation, dilute waste is transferred to the evaporator feed tank (Tank 102-AW) for evaporation. Provided the waste has not reached its concentration limit, evaporation is continued until the maximum Waste Volume Reduction (WVR) is achieved.

- The desired WVR for each 242-A Evaporator campaign is determined by boil-down studies, computer simulation, and/or process control sampling. The concentration of waste increases after each pass through the Evaporator until it reaches a concentration level consistent with engineering studies. The waste volume projection model of the 242-A Evaporator operation used in these projections cases produced DSSF with a specific gravity of 1.41. Upon reaching the desired concentration level, the concentrated waste is transferred to the evaporator receiver tank (Tank 106-AW). At the end of a campaign or when Tank 106-AW has been filled, DSSF is transferred to another DST holding tank.

- The Liquid Effluent Retention Facility (LERF) has a 6.5 million gallon storage capacity (Basin 42) for evaporator process condensate (Guthrie, 1997a).

- o The ratio of process condensate sent to LERF for every gallon of Waste Volume Reduction (WVR) for Evaporator Campaigns 94-1, 94-2, and 95-1 was 1.29, 1.24, and 1.26, respectively (Guthrie, 1996). The evaporator seal water and demister spray upgrade could reduce future process condensate production to 1.15 gallon of condensate/gallon of WVR which would lower the value used for future projections. This projection used a value of 1.20 gallon of condensate/gallon of WVR (Guthrie, 1997b). The Effluent Treatment Facility started to process the condensate stored in LERF Basins 42 and 43 in November 1995 and processed all stored condensate by August 1996 (Wagner 1996). Since the Effluent Treatment Facility has a capacity of approximately 50 Mgal/year (Wagner, 1996), it was assumed that LERF capacity would not limit future evaporator operations.

- o The maximum monthly WVR during Evaporator operation should be approximately 1500 kgal/month based on a near optimum Campaign 94-2 and 96-1 performance with approximately a 50% initial WVR per pass through the evaporator (Guthrie, 1997b).

- o An average evaporation rate of 500 Kgal/month (Guthrie, 1997b) was used in this simulation taking in to consideration:
  - the 242-A Evaporator historical processing rates
  - downtime between campaigns
  - waste characterization
  - staging and tank transfers

- o The simulation used in this projection evaporates all dilute wastes to a concentrated interim storage form in the same year that a tank has been filled. This assumption is valid if the evaporator is operating and the yearly waste generation rate has not exceeded the annual WVR limit of the evaporator. Historically, dilute wastes were concentrated to near the aluminate boundary which would produce concentrated wastes with a specific gravity which could range from 1.3 to 1.67. However, it has been noted that all of the DSTs currently on the Flammable Gas Watch List (i.e., tanks with safety concerns related to hydrogen build-up) have specific gravities greater than 1.4 (Reynolds, 1994). To avoid production of future Flammable Gas Watch List tanks, it has been proposed that all future waste concentrations should be limited to a specific gravity of 1.41 unless additional technical evaluation shows flammable gas will not build-up (Fowler, 1995 and Mulkey, 1997).

  The waste volume projection model of the 242-A Evaporator operation used in projections thru 1994, typically produced DSSF with a specific gravity of 1.50-1.55. Reducing these wastes to a specific gravity of 1.41 could increase waste storage volumes by approximately 22-35 percent, depending on the chemical composition of the waste. Although the evaporation limit for concentrated wastes was a specific gravity of 1.41, the first five evaporator campaigns in Table 3 (94-1 thru 97-1) produced concentrated wastes with a specific gravity close to 1.3 (Guthrie, 1997a). Evaporator campaign 97-2 did evaporate waste to a specific gravity of approximately 1.4. This document projects DST needs based on the evaporation of wastes to a specific gravity limit of 1.41.

- o The waste volume reductions achieved by the 242-A Evaporator since its restart in 1994 are summarized in Table 3.

Table 3. Historical Evaporator Campaigns Since the 1994 Restart

Campaign	Start Date	Waste Source	Waste Feed Type	Approximate WVR, Mgal
94-1	4/94	102-AW, 106-AW, & 103-AP	DN	2.42
94-2	9/94	102-AW, 106-AW, 101-AP, 107-AP, & 108-AP	DN	2.79
95-1	6/95	102-AW, 106-AW, 107-AP, & 108-AP	DN	2.16
96-1	5/96	102-SY, 105-AW, & 102-AY	DN	1.12
97-1	3/97	101-AN	DN-SWL	0.4
97-2	9/97	101-AY and 106-AN	DC	0.7

- No evaporator campaigns were projected for FY 1998. A cold run to be completed by September 1998 will add 50-65 Kgal of water to DSTs.

- The next evaporator campaign (99-1) will start in March 1999, to evaporate dilute waste from Tanks 102-AY, 106-AP, 101-AN, and 108-AP.

- All projection cases assumed that evaporation capability would be available annually to evaporate all dilute wastes except for the one year outage in FY 2004. The annual evaporation of dilute waste minimizes tank space requirements and allows site cleanup activities to continue unabated. [Late Note: The life of the 242-A Evaporator will be extended through the end of Phase 1 (2018). Evaporator upgrades will be completed by 2005. It is assumed that the Phase II waste processing contractor will provide evaporator capability during Phase II Operations. (O'Toole, 1998).]

- Previous projections assumed that the 242-A Evaporator would require a 1 year outage for maintenance and or upgrades every 10 years based on a 10 year design life of the 242-A Evaporator (Miskho, 1990). All three projection cases assumed a one year outage in FY 2004 (Guthrie, 1997b).

- Evaporator certification training runs prior to evaporator operation will add approximately 50 Kgal to tank farms and 50 Kgal to the LERF and will occur on a bi-yearly basis (Guthrie, 1997b). The training run in April 1995, added 57 Kgal to DSTs.

- Evaporator flushing after each campaign was previously projected to add 35 Kgal/campaign (Haigh, 1992). Actual flushes for the first three campaigns completed since April 1995 have varied from 27 to 58 kgal/campaign.

- For the years 1999-2004, it was estimated that 1 to 2 campaigns would be required each year based on waste generations, segregation requirements, and tank space availability. The additional yearly campaigns would be needed to evaporate the anticipated increased SWL (complexed and non-complexed) and TCO wastes. The WVR for evaporation of these flushes to DSSF was 99 (Sederburg, 1995).

3.3 Grout

- o No additional Grout Vaults are scheduled to be poured at the Hanford site. TWRS program planning requires that all tank wastes be separated into low-activity and high-activity fractions and each fraction be immobilized into suitable waste forms for ultimate disposal. Tanks that were originally designated and set aside as grout feed tanks were used for other purposes.

3.4 Effluent Treatment Facility

- o A new facility called the Effluent Treatment Facility (ETF) started operation in November 1995 to process the stored evaporator condensate from the LERF, newly generated evaporator condensate, and aqueous waste water containing low specific radioactivity (Wagner, 1996). Treated effluent is discharged to the State Approved Land Disposal Site (SALDS), north of the 200 West Area. This site was chosen to allow tritium to decay away before the groundwater migration reaches the Columbia River. The ETF does not remove tritium because no feasible production-scale tritium removal technology presently exists. The ETF has a capacity to treat 50 Mgal/year for future feeds. The ETF should not send any streams to DSTs.

3.5 PFP

The Plutonium Finishing Plant (PFP) is a facility in the 200 West Area which houses the processes and supporting operations for (Funston, 1997):

1) stabilization of reactive solid residues by muffle furnace calcination (OPERATIONAL);
2) shipping, receiving and storage of special nuclear materials (OPERATIONAL);
3) analytical and development laboratories (OPERATIONAL);
4) treatment and handling of PFP liquid wastes destined for tank farms and the ETF (OPERATIONAL).

An Environmental Impact Statement (EIS) was issued for public comment in November 1995 covering the PFP facility stabilization and clean out. The PFP EIS and Record of Decision (ROD) was published in May 1996. The waste volume projections are based on the preferred alternatives identified in the EIS for facility cleanout and stabilization. The volume of waste anticipated to be produced for the TPA Compliant Case is developed from the existing waste generation rate at PFP (100 untreated gallons/month), and the anticipated use of a direct denitration vertical calciner coupled with an ion exchange processing system currently being developed and tested by the development laboratories. The vertical calciner is the most promising technology for plutonium residue stabilization and facility clean out. All projection cases projected that PFP stabilization and clean out would generate 27 Kgal of additional waste from 1998 through 2006 (Funston, 1997). The WVRF to evaporate PFP wastes to DSSF is 81% (Sederburg, 1995). Flush volumes for PFP stabilization waste streams is 22 per cent (flushes of waste transfer lines from PFP to 244-TX and from 244-TX to Tank 102-SY).

The percent solids experienced in past PFP waste generations are listed below (Barrington, 1991):

% Solids in PRF waste	3.5%
% Solids in RMC waste	4.4%
% Solids in lab waste	4.5%

3.6 PUREX

The Plutonium Uranium Extraction (PUREX) Facility was used to separate irradiated N Reactor fuel into plutonium nitrate, uranyl nitrate hexahydrate (UNH), neptunium nitrate, and waste products. The main processing operations involved dissolution of cladding and irradiated fuel, solvent extraction and conversion of plutonium nitrate to plutonium oxide. Acid recovery, solvent treatment systems, and off-gas treatment supported the major processes.

The deactivation of PUREX was completed in FY 1997 and the waste transfer system has been deactivated. However, condensate is collected in the PUREX main stack catch tank (216-A-TK-2) and the #2 Filter catch tank (V11-1). This accumulation would result in approximately 5 Kgal of dilute waste being transferred to tank farms once per year (Eiholzer, 1997).

All three projection cases projected 5 Kgal/year of waste additions from PUREX. Based on the average waste composition presented for PUREX TCO wastes, the WVRF for evaporation of PUREX TCO wastes to DSSF is 99% (Sederburg, 1995). Flush volumes for PUREX TCO waste streams are 10 per cent.

3.7 S Plant

S Plant (or 222-S Labs) is a dedicated laboratory facility. The Laboratory currently provides analytical chemistry services in support of Hanford processing plants and tank characterization. Emphasis is on waste management processing plants, environmental monitoring programs, B Plant, Tank Farms, 242-A Evaporator, Waste Encapsulation Storage Facility (WESF), Plutonium Finishing Plant (PFP), research support activities, and essential materials. Most of the radioactive liquid waste generated at the laboratory complex originates from analytical activities performed within the 222-S Laboratory in support of tank characterization (Tollefson, 1998). Radioactive and radioactive hazardous (mixed) wastes generated by the 222-S Laboratory are discharged to the 219-S Waste Handling Facility. Dilute, non-complexed wastes are currently being transferred via pipeline to Tank 102-SY. Projected S Plant monthly waste generations rates (Tollefson, 1998) were approximately 1.0 to 1.7 Kgal/month for FY 1998 through 2028 for all projection cases. Based on the waste composition presented for 222-S Laboratory wastes, the WVRF for evaporation of 222-S miscellaneous wastes to DSSF is 99% (Sederburg, 1995). Flush volumes for 222-S waste streams is 22 per cent.

3.8 Salt Well Liquid Pumping

Salt Well Liquid (SWL) pumping will occur for single-shell tanks (SSTs) which have 50,000 gallons or more of drainable interstitial liquid. Pumping is scheduled to stop when the output rate decreases to 0.05 gallons per minute. SWL pumping assumptions for all three projection cases are listed below:

- A 50 percent saltcake porosity/21 percent sludge porosity were used to estimate the remaining SWL volume, resulting in a remaining volume of 5.36 million gallons (Brown, 1996) without flush and dilution. The pumping schedules used for this year's projections are covered later in this section. The WVRF for evaporation of dilute non-complexed (DN) SWL to DSSF is 47% (Sederburg, 1995). The WVRF for evaporation of dilute complexed (DC) SWL to Complexant Concentrate (CC) is 10% (Sederburg, 1995). [Late Note: Estimate of remaining SWL volume could be increasing to 6.2 million gallons without flush (Schreiber, 1998).]

- It was projected that dilution and flushing of the salt well liquid and transfer lines would generate approximately 1.53 Mgal (28 percent) of water. The WVRF used for this flush is 99% (Sederburg, 1995).

- Approximately 1.64 Mgal (30 percent) of the total SWL volume is complexed based on available analytical information.

- Based on the latest SWL pumping project plan (Ross, 1998), Tanks 101-AN, 106-AP, and 108-AP were used as the 200 East Area receiver tanks.

- Pumping SWL in West Area presents special problems due both to the limited tank space available and due to the transuranic (TRU) heel in Tank 102-SY. Tanks 101-SY and 103-SY contain complexed waste and are also designated as Watch List Tanks. Addition of waste to Watch List tanks is prohibited unless a safer alternative cannot be found.

  Therefore, Tank 102-SY was designated as the West Area SWL receiver for both non-complexed and complexed SWL. Tank 102-SY contains approximately 123 Kgal of TRU solids (Table 10) that are not scheduled to be retrieved until January 2006. Historically, complexed waste and TRU wastes have been segregated to minimize the amount of waste requiring more expensive disposal and to comply with U.S. Department of Energy (DOE) Order 5820.2A. The Hanford Site has implemented this order by segregating waste that was considered complexed (greater than 10 grams/liter total organic carbon) from TRU waste sludge (Reynolds, 1995). The schedule presented in Table 4 would require pumping complexed SWL over the sludge in Tank 102-SY in order to meet TPA milestones for the years 1998-2000. Studies are being conducted to resolve this issue and to determine exactly how much of the waste in the 200 West Area are complexed (Estey, 1996). Some options include--delaying complexed SWL pumping in West Area until Tank 102-SY solids are retrieved; accelerating the retrieval of the TRU solids from Tank 102-SY; dilution and retrieval of the waste from either Tank 101-SY or 103-SY to free up additional tank space; conduct experiments to prove the complexed SWL can be added to the TRU solids in Tank 102-SY without solubilizing the TRU; or use a DCRT to pump complexed SWL to East Area without sending the waste to Tank 102-SY. In this projection, the complexed wastes are shown being pumped to Tank 102-SY to meet the current TPA schedule.

o For projection Case 1 (TPA Compliant Case), it was assumed that all SWL would be pumped from FY 1998 through the end of FY 2000 to meet TPA milestone M-41-00 (volume for Tank 106-C included with single shell tank solids retrieval). Historical pumping volumes and the projected SWL pumping volumes (without flush) for Case 1 are presented in Table 4. [Late Note--SWL pumping schedules, volumes, and budgets are currently being reviewed with Ecology to determine which SWL pumping schedules are actually achievable.]

Table 4. Salt Well Pumping Schedule for Case 1 (TPA Complaint Case)

Salt Well Pumping Schedule for 50% Saltcake/21% Sludge Porosity (Brown, 1996)					
FISCAL YEAR	EAST AREA		WEST AREA		TOTALS
	DN	DC	DN	DC	
Historical SWL Pumping 1989-1997					
1989	55 KGAL	0 KGAL	0 KGAL	17 KGAL	72 KGAL
1990	44 KGAL	0 KGAL	0 KGAL	0 KGAL	44 KGAL
1991	227 KGAL	0 KGAL	0 KGAL	0 KGAL	227 KGAL
1992	121 KGAL	0 KGAL	0 KGAL	0 KGAL	121 KGAL
1993	0 KGAL	0 KGAL	37 KGAL	0 KGAL	37 KGAL
1994	189 KGAL	0 KGAL	32 KGAL	0 KGAL	221 KGAL
1995	194 KGAL	105 KGAL	18 KGAL	0 KGAL	317 KGAL
1996	22 KGAL	0 KGAL	218 KGAL	0 KGAL	240 KGAL
1997	23 KGAL	0 KGAL	140 KGAL	0 KGAL	163 KGAL
Projected SWL Pumping 1998-2000 (without flush)					
1998	0 KGAL	0 KGAL	238 KGAL	0 KGAL	238 KGAL
1999	803 KGAL	696 KGAL	1013 KGAL	0 KGAL	2512 KGAL
2000	15 KGAL	67 KGAL	1677 KGAL	874 KGAL	2633 KGAL
TOTAL 1998-2000	818 KGAL	763 KGAL	2928 KGAL	874 KGAL	5383 KGAL

- For projection Cases 2 and 3, it was assumed that SWL pumping would be completed by the end of FY 2004 (Ross, 1998). The projected pumping volumes for Cases 2 and 3 are presented in Section 4.1.

3.9 Single-Shell Tank Solids Retrieval

- This projection assumed that the retrieval of Tank 106-C solids would be started in September 1998 and completed by June 1999 (Kirch, 1997). Initially, approximately 170 Kgal of solids would be retrieved. Retrieval of Tank 106-C solids will require approximately a 3:1 ratio of dilution water to solids (Estey, 1994). Solids retrieved from Tank 106-C will be stored in Tank 102-AY.

- Approximately 11.9 Mgal of sludge and 22.9 Mgal of saltcake will be retrieved from SSTs (Hanlon, 1998). Dilution of these solids for retrieval and processing results in a total retrieved volume of approximately 108 Mgal (Penwell, 1998a).

- Saltcake would be diluted to 5 M Na and sludge will be diluted to 10 weight percent solids (Kirkbride, 1997). Approximately a 3:1 ratio of dilution water to solids will be required for the retrieval of the remaining SST solids. It is further assumed that all solids will be removed from the SSTs and that SST site closure will be complete by FY 2024 (M-45-06).

- For projection cases 1 and 3, the retrieval schedule for SST solids is based on information received from Disposal Engineering (Penwell, 1998a) which will start retrieval in December 2003 (M-45-03-T1) and was completed by the end of FY 2018 (TPA milestone). The retrieved volume of waste for this case is approximately 2.8 Mgal for FY 2004-2005 and an additional 3.6 Mgal for FY 2006-2007. By the end of FY 2013, this year's schedule would retrieve 10.9 Mgal more waste than the schedule used for the 1997 OWVP. The larger volume retrieved by the end of FY 2013 was caused in part by the restriction to retrieve one SST/farm at a time with the exception of TX farm, which can have two simultaneous retrievals after completion of the TY farm retrieval. This restriction on the number of SSTs to be retrieved at one time has caused more waste to be retrieved earlier (Penwell, 1998b). The as retrieved volumes for the remaining SST solids are shown in the spreadsheet for the TPA Compliant Case (Section 5.1) and are based on retrieval at 5 M Na.

3.10 T Plant

T Plant's primary mission is decontamination and treatment of radiologically and chemically contaminated waste and equipment located throughout the Hanford site (McDonald, 1997). T Plant also provides inspection and repackaging services to various Hanford facilities. The 2706-T Low-Level Decontamination Facility (where low-level equipment decontamination is performed) is an approved decontamination facility that commenced operation in September 1994. Limited 221-T canyon decontamination activities (primarily Tank Farms long-length contaminated equipment) were initiated in 1995.

T Plant is currently testing new decontamination techniques (ice blasting and CO_2 decontamination systems) which have reduced liquid waste generations from those reported previously. Dilute, non-complexed wastes collected at T Plant during decontamination, repackaging, condensate collection, or railcar certification are currently being transported to 204-AR vault via railcar. These wastes contain approximately 5 volume percent solids (McDonald, 1997). Projected T Plant monthly waste generations (McDonald, 1997) were based on a combination of anticipated work loads and actual observed generation rates. The projected volumes supplied by T Plant engineers ranged from 1.4 Kgal/month to 2.7 Kgal/month (the exact waste volume generation used for each year is shown in the spreadsheet for the TPA Compliant Case--Section 5.1). All three projection cases used the same generation rates. The WVRF for evaporation of T Plant miscellaneous wastes to DSSF is 99% (Sederburg, 1995). Flush volumes for T Plant waste streams are 22 per cent.

3.11 Tank Farms

There are currently 28 double-shell tanks (DSTs) used to receive, store, and evaporate the liquid wastes generated at the Hanford facilities to an interim waste form. The interim waste form (e.g., DSSF) is currently stored in tank farms awaiting processing and vitrification for final disposal. Tank farm waste generation sources and operational considerations are listed below for the aging and non-aging waste tanks. Tank Farm waste generations are primarily from line, cross-site, and air-lift circulator flushes.

Aging Double-Shell Tanks

Four of the DSTs (AY and AZ farms) are designated as aging waste tanks and were designed to store high-heat wastes (e.g., NCAW wastes or wastes containing high-heat loads due to the presence of ^{90}Sr or ^{137}Cs). The aging waste tanks are equipped with condensers and air-lift circulators. The purpose of the condensers is to handle the vapors from primary tank vent systems when hot liquid is present. Condensates are collected in catch tanks (e.g., 151-AZ, 152-AX, or TK-417) and returned either to an aging waste tank or to a dilute receiver tank. The air-lift circulators aid in suspending NCAW solids and in heat removal. Air-lift circulators require periodic flushing (approximately once/week) to prevent clogging when they are operating. When the air-lift circulators are not operating, flushing is less frequent.

Aging waste tank operation assumptions used in all three projections follow:

- Aging waste tanks can be used for storage of dilute non-aging waste.

- It is assumed that there will be no additional aging waste produced by the Hanford facilities. However, certain wastes containing high ^{90}Sr or ^{137}Cs contents may require storage in aging waste tanks due to their radioactivity. HLW returns to DSTs during Phase 2 processing will be stored in three aging waste tanks (see section 3.18 for more detail).

- Single-shell tank (SST) solids retrieved from Tank 106-C will be stored in an aging DST (Tank 102-AY) due to the high heat content of the solids.

- One million gallons of aging tank space is kept available for receiving the contents of an aging waste tank, in the unlikely event of a tank leak (Department of Energy order 5820.2A).

- o Tank 102-AY was designated as the 200 East Area dilute receiver for non-complexed wastes through mid FY 1996 and then Tank 106-AP was designated as the 200 East Area dilute receiver. This change allowed Tank 102-AY to be used to store the solids retrieved from Tank 106-C. Tank 106-AP is currently receiving direct transfers of wastes from B Plant and rail or truck shipments via 204-AR vault from S Plant, T Plant, 100 Area, 300 Area, and 400 Area. Tank 106-AP is also receiving non-complexed SWL.

Non-Aging Double-Shell Tanks

The remaining 24 DSTs are called non-aging waste tanks and are used to store wastes that do not contain high-heat loads in accordance with applicable operational and waste segregation policies. Non-aging waste tank operation assumptions are as follows:

- o Approximately 66 Kgal of caustic will be added to Tank 107-AN in FY 2000 to mitigate the low caustic condition in the tank for all projection cases (Carothers, 1998).

- o Current operational tank usage for this projection are summarized in Table 5. Projected Tank usage will be covered in Section 5.

Table 5. Current Operational Tanks and Usage

Operation	Designated Tank
Evaporator Feed Tank	Tank 102-AW
Evaporator Receiver Tank	Tank 106-AW (tank level varies)
200 East Dilute Receiver Tank	Tank 105-AW (PUREX direct transfers; 100 Area wastes)
200 East Dilute Receiver Tank	Tank 106-AP (FY 1998-2000)
200 West Dilute Receiver Tank	Tank 102-SY (FY 1998-2015)
200 East SWL Receiver (DN)	Tank 101-AN and 106-AP (FY1998-2000)
200 East SWL Receiver (DC)	Tank 108-AP (FY 1998-2000)
200 West SWL Receiver (DN)	Tank 102-SY
200 West SWL Receiver (DC)	Tank 102-SY
Private Contractor Feed Tanks	Tanks 106-AP and 108-AP (~FY 2001)
Intermediate Staging Tanks	Tanks 102-AP and 104-AP (~FY 2001)
Sr/TRU/Entrained Solids Return Waste	Tank 107-AP (~6/2002)
Dilute Feed Staging	Tanks 104-AP, 107-AP; Tank 104-AN (~FY 2002)
Spare Tank Space	Tank 103-AP (1998-1999); distributed space from mid FY 1999 on

- o Starting in FY 1999, 0.72 Mgal of operational space in the evaporator Feed and Receipt Tanks (Tanks 102-AW and 106-AW) was used as spare space (Awadalla, 1995) in all three projection cases.

- It was assumed that the TRU solids in Tank 102-SY would be retrieved to Tank 105-AW starting in January 2006. The NCRW solids in Tank 105-AW were not combined with the solids in Tank 103-AW in this projection.

- Flushes are generated during the receipt of waste transfers either from railroad tank cars, tanker trucks, or after tank to tank transfers. Percent flushes are included with a description of each of the facility generations in Section 3.

- Tank 106-AP is currently receiving direct transfers of wastes from B Plant and rail or truck shipments via 204-AR vault from S Plant, T Plant, 100 Area, 300 Area, and 400 Area.

- Tank 108-AP will be used as the complexed SWL receiver and Tanks 101-AN and 106-AP as the non-complexed SWL receivers in 200 East Area (Ross, 1998).

Projected waste generations for Tank Farms were based on a combination of previously observed waste generation rates and anticipated operational needs that are explained below:

- <u>Tank Farm water additions to DSTs</u>. Tank Farms waste generation rates and flushing activities generally increase with the restart of the 242-A Evaporator due to the additional waste transfers. The 242-A Evaporator was restarted in April 1994. During the period April 1994 through May 1995, the average monthly waste generation rate for Tank Farms was 10.92 Kgal/month. The average monthly waste generation for Tank Farms during FY 1997 was ~2.7 Kgal/month. The target rate set for Tank Farms waste generations was 10 Kgal/month. All three projection cases estimated that Tank Farms would generate 10 Kgal/month or 120 Kgal/year to cover transfer line and air-lift circulator flushes. The WVR for evaporation of these flushes to DSSF was 99% (Sederburg, 1995).

- <u>Cross-site Transfers</u>. All projection cases assumed that either the existing cross-site transfer line or the new cross-site transfer line (Project W-058, operational in FY 1998) would be available to allow cross-site transfer of SWL, facility generations, DST solids from Tank 102-SY and/or SST solids. It was assumed that all wastes containing solids would be cross-sited via the new line which has inline pumps to Tank 104-AN. Without operable cross-site lines many of the TPA milestones involving West area wastes could not be achieved.

  Previous projections have estimated that 50 Kgal of water (35 Kgal testing + 20 Kgal for transfer) would be needed for cross-site transfers. In this projection the water addition for cross-sites was reduced to 35 Kgal/transfer due to waste minimization actions defined for the FY 1995 transfer. During the period 1998-2001, approximately two cross-sites would be needed each year due to the volume of SWL being pumped. Based on the projected cross-site testing and transfers anticipated, 70 Kgal/year was projected for the period FY 1998-2001. All three projection cases used the same volumes for cross-site transfer line tests and flushes. The WVR for evaporation of these flushes to DSSF was 99% (Sederburg, 1995).

- o Tank Fill Limits (except for special tank fill considerations):
  - AY, AZ Tanks: 980 Kgals
  - All other DSTs: 1140 Kgals

- o The assumptions used to simulate tank transfers in this projection are listed below:

  - Tank 102-SY: 1082 Kgal in the tank, and PRF not operating, pumped down to 358 Kgal until TRU solids have been removed.
  - Tank 102-AY: Start transfer at 900 Kgal.
  - Tank 105-AW and other dilute receivers: Start transfer at 1000 Kgal, pump down to 50 Kgal above solids.

3.12 UO_3 Facility

Deactivation of the UO_3 Facility is complete and therefore, no waste will be sent to DSTs.

3.13 Waste Sampling and Characterization Facility (WSCF)

The Waste Sampling and Characterization Facility (WSCF) was started in FY 1994. This projection assumed that WSCF would send its waste to ETF and not to DSTs (Collins, 1996).

3.14 100 Area

100-N Basin

The 100-N Basin was constructed in 1963 to receive irradiated fuel assemblies discharged from the N Reactor for the purpose of inspection, storage, and preparation for shipment. In 1988 the N Reactor was placed in a "cold standby" status (shutdown but capable of restarting). In 1989 all nuclear fuel was removed from N Basin and transferred to K Basin. In 1991 the Department of Energy-Richland (DOE-RL) directed Westinghouse to begin deactivation activities. A significant quantity of radioactively contaminated equipment, hardware, debris, and sediment have accumulated in 100-N Basin that will need to be removed. It was assumed that deactivation of the N Basin would not send any wastes to DSTs but wastes would instead be transferred to the Environmental Restoration Disposal Facility (ERDF) (Logan, 1998).

100-K Basin

Fuel handling operations have resulted in some cladding damage to N-Reactor fuel. Subsequent fuel oxidation resulted in fuel and fission products accumulating in fuel canisters and in K Basin where the fuel handling occurred. Aluminum oxide, iron oxide, concrete grit, and other debris has accumulated and mixed with the fuel corrosion products to form a sludge on the basin floor. Approximately 350 Kgal of water and sediment (approximately 18.5 Kgal of sediment) will be transferred to DSTs (Alderman, 1997). New schedules project that these wastes will be transferred to Tank 105-AW in FY 2003. [Late Note--transfer date for 100K wastes may be changed to FY 2005 (Honeyman, 1998b)]. The above generations for 100-K Basin cleanout were used in all three projection cases. [Late Note: The options to dispose of 100-K wastes are being reviewed and may change in the future. One option would dissolve the solids in acid, destroy polychlorinated biphenyls (PCBs), blend with depleted uranium, and neutralize before sending the wastes to tank farms--this option would increase the liquid and solid volumes sent to tank farms.]

105-F & 105-H Basins
Plans to cleanout the 105-F and 105-H Basins are still being reviewed and the date of cleanout is uncertain due to funding. The projected plan is to clean out the 40,000 gallons in 105-F in the year 2000 and the 200,000 gallons from 105-H in the year 2005 (Mihalic, 1997). These assumptions for 105-F and 105-H Basin cleanout were used for all three projection cases.

The WVRF for evaporation of all 100 Area Basin wastes to DSSF is 99% (Sederburg, 1995). Flush volume for 100 Area wastes is 44 per cent.

3.15 300 Area

Facilities in the 300 Area are used primarily for research and development activities or for analytical support. Some waste received in FY 1995 was generated by decon of facilities. Liquid wastes from the various 300 Area Facilities are transferred to the 340 Facility. Liquid wastes collected at the 340 Facility are transferred to 204-AR vault in 20,000 gallon railroad tank cars (after September 1998, shipments will likely be via a truck tanker due to the pending cessation of rail service (Halgren, 1997)). In the future, the 340 Facility will be closed and a new facility will be installed for Pacific Northwest National Laboratory to transfer wastes from its 300 Area facilities to the DSTs. Facilities in the 300 Area sent 26 Kgal of waste (includes flush) to DSTs (2.2 Kgal/month) in FY 1997. All three projections predicted that 2.3 Kgal/month of miscellaneous waste would be generated from 300 Area facilities during FY 1998. Projected waste generations for FY 1999 and beyond varied from 0.33 to 1.4 Kgal/month. Based on the chemical composition supplied for 300 Area waste streams, the WVRF for evaporation of 300 Area miscellaneous wastes to DSSF is 94% (Sederburg, 1995). Flush volume for 300 Area waste streams is 44 per cent.

3.16 400 Area

There are three major facilities in the 400 Area (Dillhoff, 1997). These include the Fast Flux Test Facility (FFTF), the Maintenance and Storage Facility (MASF), and the Fuel and Material Examination Facility (FMEF). Radioactive liquid waste is primarily generated in conjunction with the removal of residual sodium from reactor components or with decontamination activities. A phased process was begun in December 1993 to place the FFTF into a radiologically and industrially safe shutdown condition. Shutdown of the FFTF has increased the amount of liquid waste generated by the plant's Sodium Removal System. Approximately 11 Kgal of wastes were received from 400 Area in FY 1994-1995 (~0.5 Kgal/month). All three projection cases projected a 7 Kgal shipment of miscellaneous waste would be generated from 400 Area facilities every third year starting in FY 1999. The WVRF for evaporation of 400 Area miscellaneous wastes to DSSF is 94% (Sederburg, 1995). Flush volume for 300 Area waste streams is 44 per cent.

3.17 Phase 1B Privatization Processing

- Privatization Concept. The revised DOE strategy for treatment of Hanford tank wastes, termed "privatization," would use private contractors to design, permit, build, operate, and decommission the facilities for waste treatment and immobilization (DOE, 1995). Final details of the privatization work will not be developed until later in the process and the assumptions listed below are subject to change. As currently proposed, privatization would be divided into two phases. Phase 1B would include privatization of waste tank supernatant processing, Low-Activity Waste (LAW) immobilization, and an optional High-Level Waste (HLW) immobilization (Washenfelder, 1996b) by private contractors. The scale of processing during Phase 1B of privatization has been established to demonstrate the technical and commercial capability. Phase 2 of privatization would include additional tank waste retrieval, supernatant processing, sludge/solid processing, LAW immobilization, HLW immobilization, disposition of encapsulated Cs/Sr, and interim storage of immobilized waste (Washenfelder, 1996 and Kirkbride, 1997). The schedule listed below was used for the Case 1 projection. Cases 2 and 3 used a different treatment schedule which is presented in Section 4.0 along with the other assumptions unique to these projection cases.

- Phase 1B Schedule. The target schedule for Phase 1B is summarized below (used for Case 1 projection only):

-Start construction	December 31, 1999
-Operations	June 1, 2002-June 1, 2011

- Intermediate Feed Staging Tanks. Tanks 102-AP and 104-AP were used for intermediate staging of wastes by the Project Hanford Management Contractor (PHMC). The intermediate feed staging tanks were assumed to be fully operational on 10/1/2000.

- Privatization Contractor Feed Tanks. Wastes from Tanks 102-AP and 104-AP will be transferred to Tanks 106-AP and 108-AP, respectively. Tanks 106-AP and 108-AP will be used as privatization contractor feed tanks or vendor feed tanks. At the time these tanks were transferred to the private contractors they remain in use by the PHMC Team for waste management activities (Kirkbride, 1997).

- HLW Processing and Immobilization. Phase 1B processing of tank waste sludges would be conducted within existing DSTs and would involve sludges in Tanks 101-AZ, 102-AZ, 102-AY, and the high heat solids retrieved from single-shell tank 106-C. The NCAW supernates removed prior to in-tank washing of the NCAW solids, could not be combined into a single aging tank (Tank 101-AY) due to the 5 M Na limit but would be concentrated and sent to Tank 101-AY and an additional non-aging tank (Powell, 1996b). The in-tank washing assumptions summarized in Table 6 and presented below were obtained from Disposal Engineering (Kirkbride, 1997).

In Revision 21 of this document, it was assumed that all NCAW solids and the 106-C solids would be combined into one aging waste tank (Tank 102-AZ) and that all NCAW supernates would be concentrated into one aging waste tank (Tank 101-AZ). Since that document was published, studies have been completed which looked at numerous sludge washing/combination options (Powell, 1996a). The alternatives for consolidating high heat sludges have been reviewed by a decision board comprised of Hanford contractor management, a DOE/RL representative, and a WDOE representative. It was concluded that consolidating all the sludges into a single tank would require modifications to the tank farm safety basis. The preliminary decision reached was not to consolidate all the high heat sludges into a single tank. The selected alternative (Alternative 8 Modified) would wash the sludges in the tanks they reside in without additional consolidation of solids.

- <u>In-Tank Washing of Tank 101-AZ Sludge</u>
  The first step of in-tank washing for the Case 1 projection involved the decanting of supernatant from Tank 101-AZ to Tank 101-AY in August 2000. The decanted aging waste supernate from Tank 101-AZ would require storage in an aging waste tank due to its heat content.

  Approximately 146,000 gallons of wash solution (0.1 M sodium hydroxide, 0.011 M sodium nitrate) would be added in August 2000. The solids would be mobilized with mixer pumps, settled for one month, and the wash would be decanted in January 2001 to a non-aging DST.

  The washed NCAW solids would then be sampled to determine the effectiveness of the washing process. This washing operation would be conducted a total of three times during the period August 2000 through January 2001. The washed solids were covered with a cover solution in January 2001 that would be used to mix and transfer the washed solids to the private contractors for disposal during the period May 2002 through January 2003.

- <u>In-Tank Washing of Tank 102-AZ Sludge</u>
  The supernatant from Tank 102-AZ will be concentrated in-tank and then decanted in September 2001. A portion of this supernatant would go to Tank 101-AY with the remainder going to non-aging DSTs. Due to questions about the allowable final Na concentration and the amount of heat in the supernatant, storage of the remaining supernatant could require one or two additional DSTs (Powell, 1996a and 1996b). In projection Case 1, it was assumed that the NCAW supernatant would be stored in Tank 101-AY plus one additional non-aging DST.

  Approximately 213,000 gallons of wash solution (0.1 M sodium hydroxide, 0.011 M sodium nitrate) would be added in September 2001. The solids would be mobilized with mixer pumps, settled for one month, and the wash would be decanted in April 2002 to a non-aging DST.

  The washed NCAW solids would then be sampled to determine the effectiveness of the washing process. This washing process would be conducted a total of four times during the period September 2001 to

April 2002. Again, the washed solids would be covered with a cover solution in April 2002 that would be used to mix and transfer the washed solids to the private contractors for disposal during the period September 2003 to June 2004.

- <u>In-Tank Washing of Tank 102-AY/Tank 106-C Sludges</u>
  The solids from Tank 102-AY/Tank 106-C would be transferred to Tank 101-AZ for in-tank washing in February 2003. Approximately 320,000 gallons of wash solution (0.1 M sodium hydroxide, 0.011 M sodium nitrate) would be added in February 2003. The solids would be mobilized with mixer pumps, settled for one month, and the washes would be decanted to a non-aging DST for further evaporation.

  The washed NCAW solids would then be sampled to determine the effectiveness of the washing process. This washing process would be conducted a total of two times during the period February 2003 through May 2003. Again, the washed solids would be covered with a cover solution that would be used to mix and transfer the washed solids to the private contractors for disposal during the period March 2005 through August 2007.

- <u>In-Tank Washing of Tank 104-C Sludges</u>
  Tank 104-C solids would be retrieved to Tank 102-AY in August 2004. These solids would be transferred to Tank 102-AZ for washing in August 2005. Washing of the Tank 104-C solids would be conducted during the period October 2006 through January 2007. Again, the washed solids would be covered with a cover solution that would be used to mix and transfer the washed solids to the private contractors for disposal during the period April 2008 through July 2009.

  All three projection cases assumed that approximately 340 metric tons of high-level waste oxides would be transferred to the vendor for immobilization during the period June 2002 through August 2009. It was assumed that this action would process all solids from Tanks 101-AZ, 102-AZ, 102-AY, 106-C, and 104-C. The private contractor would provide a tank for receipt of the washed sludges; existing DSTs would not be used for these functions (Washenfelder, 1996b). In-tank washing activities and waste work-off schedules are summarized in Table 6 (Slaathaug, 1998).

Table 6. Summary of In-Tank Washing Activities

Date	In-Tank Washing Activity
September 1998-June 1999	Complete retrieval of Tank 106-C solids into Tank 102-AY.
Aug. 2000	Decant the NCAW supernate from Tank 101-AZ to Tank 101-AY.
Aug. 2000-Jan. 2001	Wash NCAW solids in Tank 101-AZ three times.
September 2001	Decant Tank 102-AZ supernatant to Tank 101-AY and one other non-aging DST.
September 2001-April 2002	Wash NCAW solids in Tank 102-AZ four times.
May 2002-January 2003	Transfer Tank 101-AZ NCAW solids to contractors.
September 2003-June 2004	Transfer Tank 102-AZ NCAW solids to contractors.
February 2003	Transfer solids (102-AY/106-C) from Tank 102-AY to Tank 101-AZ
February 2003-May 2003	Wash solids (102-AY/106-C) in Tank 101-AZ.
March 2005-August 2007	Transfer Tank 102-AY/106-C solids from Tank 101-AZ to contractors.
August 2005	Transfer Tank 104-C solids from Tank 102-AY to Tank 102-AZ.
October 2006-January 2007	Wash solids (104-C) in Tank 102-AZ.
April 2008-July 2009	Transfer Tank 102-AZ solids (104-C) to contractors

- Low-Activity Waste (LAW) Treatment. The current DOE strategy calls for a demonstration of LAW treatment and immobilization by private vendors at a rate dependent on the type of waste being processed. Envelope A feed is typically double-shell slurry feed (DSSF), double-shell slurry (DSS), or dilute non-complexed waste (DN). Envelope B feed is NCAW supernate. Envelope C feed is typically complexant concentrate (CC). Minimum and maximum processing quantities for each contractor as well as the approximate quantity of sodium processed for the Case 1 projection is listed Table 7 (Honeyman, 1998a).

Table 7. Estimated Waste Quantity Processed for Case 1

Waste Type	Minimum Amount Processed for Two Contractors (Metric Tons Sodium)	Maximum Amount Processed for Two Contractors (Metric Tons Sodium)	Approximate Quantity Processed for Projection Case 1 (Metric Tons Sodium)
Envelope A	5200	9800	~5399
Envelope B	200	2000	~ 234
Envelope C	200	4800	~4578
Total A+B+C	---	10200	<10,200

- Schedule for LAW Processing. The schedule used for processing of LAW for projection Case 1 is summarized in Table 8 (Honeyman, 1998a). Dates shown are the date the wastes are transferred to the intermediate feed staging tank and not the actual processing date. Actual processing of wastes begins in June 2002. Tank dilutions, contractor number, and multiple batches are not shown. This schedule was developed from input supplied by Disposal Engineering (Slaathaug, 1998). Solids are left in the tanks when wastes are retrieved for LAW processing.

- Storage of Separated TRU and Entrained Solids. For projection Case 1, entrained solids and transuranic (TRU) elements removed from LAW waste by the private contractors were assumed to be returned to one DST for storage--Tank 107-AP. Wastes from this tank are later transferred to Tank 101-AZ for subsequent disposal.

Table 8. Projected Processing Schedule for Phase 1B for Case 1

Tank	Waste Type	Envelope	Volume with solids (Kgal)	Approximate Quantity of Na Delivered (MT Na)	Existing or Future Waste	Transfer Date for Processing
105-AN	DSSF	A	1128	~1027	Existing	3/2001
104-AN	DSSF	A	1057	~1070	Existing	10/2001
101-AW	DSSF	A	1128	~ 856	Existing	1/2003
103-AN	DSS	A	957	~1170	Existing	10/2003
101-AP 104-AW	DSSF	A	~2116	~1276	Future	6/2004
101-AY	NCAW Supernate	B	215 OF 978	~ 234	Future	3/2005
107-AN	CC	C	1057	~ 782	Existing	4/2006
102-AN	CC	C	1079	~ 954	Existing	8/2006
106-AN	CC	C	1088	~ 822	Future	12/2006
101-SY	CC	C	1114	~1230	Existing	1/2007
103-SY	CC	C	747	~ 789	Existing	8/2007

3.18 Phase 2 Privatization Processing

- The scale of processing during Phase 1B of privatization has been established to demonstrate the technical and commercial capability. Phase 2 of privatization would include the remaining tank waste retrieval, supernatant processing, sludge/solid processing, LAW immobilization, HLW immobilization, disposition of encapsulated Cs/Sr, and interim storage of immobilized waste (Washenfelder, 1996b). The proposed target schedule for Phase 2 processing is summarized below:

Contract Award	2004
Design, permitting, licensing, construction, and startup	
-Low-Activity Wastes	2005-2011
-High-Level Wastes	2005-2013
Operations	
-Low-Activity Wastes	2011-2021
-High-Level Wastes	2013-2028
Estimated Maximum Processing Rates (Wittman, 1997a and 1997B)	
-Liquid Wastes, Mgal/yr @ 7M Na	17.2
-Liquid Wastes, Mgal/yr @ 5M Na	24.1
-Solid Wastes, Mgal/yr (5M Na or 10 wt% solids)	1.55

  Processing rates will ramp up during Phase 2--1/3 full rate the first year, 2/3 full rate the second year, and full rate the third year. Three aging waste tanks will be needed to store HLW returns from Phase 2 processing.

3.19 Watch List/Safety

- All three projection cases assumed that agitation using a mixer pump would continue to be used for mitigation of the flammable gas buildup in Tank 101-SY. It was assumed that Tanks 101-SY and 103-SY would not require dilution until just prior to retrieval for processing which was scheduled to start in Phase 1B. Tank 101-SY was diluted to approximately 7 M Na and transferred to Tank 102-SY by January 2007. The retrieved Tank 101-SY wastes were transferred from Tank 102-SY to Tank 104-AN and then to Tanks 102-AN and 107-AN. Tank 103-SY was diluted up to approximately 7 M Na and transferred to Tank 102-SY by August 2007. Tank 103-SY wastes were transferred from Tank 102-SY to Tank 104-AN and then to Tanks 102-AN and 107-AN.

  All three projection cases assume that timely permission is obtained to remove waste from watch-list tanks used as LAW feed sources and to remove the watch-list designation from that tank immediately after retrieval.

  All three cases assume that the authorization basis is amended to support all activities related to Phase 1B activities (for example, LAW feed staging and delivery, HLW feed staging and delivery, return of Sr/TRU and entrained solids, etc.

3.20 Spare/Contingency Space

- Spare space is space reserved in case of a leak in a double-shell tank per DOE Order 5820.2A. Contingency space has historically been set aside to account for possible inaccuracies in the WVP software when projecting waste generations and/or waste volume reduction factors.

  A total of 2.28 million gallons (one aging and one non-aging tank) of spare/contingency space was reserved for all three projection cases. From FY 1999 on, 0.72 million gallons of the operational space in Tanks 102-AW and 106-AW was designated as part of the 2.28 million gallons of spare space (Awadalla, 1995) in all three projection cases. The remaining 1.56 million gallons of space was distributed spare space.

3.21 Waste Segregation

Waste segregation and compatibility are requirements of DOE Order 5820.2A (DOE, 1990) and WAC 173-303-395 (Dangerous Waste Regulations). The overriding purpose of waste segregation and compatibility are to ensure the safety of waste storage and tank farms operations; to minimize future processing costs; and to comply with DOE Order 5820.2A and WAC 173-303-393. Wastes that are typically segregated include:

- Phosphate Wastes--dilute phosphate (DP) or concentrated phosphate (CP).
- Wastes Containing High Organic Concentrations--dilute complexed (DC) or complexant concentrate (CC).
- TRU containing wastes--Neutralized Cladding Removal Wastes (NCRW solids) or PFP solids (PT).
- Watch list tank wastes to prevent inadvertent commingling with other wastes.
- Pretreated waste streams.
- Washed NCAW solids, etc.
- Concentrated interim waste types--e.g., double-shell slurry feed (DSSF) or double-shell slurry (DSS) need to be separated from dilute wastes to prevent the need to reconcentrate.
- Wastes exhibiting exothermic reactions.

All three projections assume that current waste segregation practices are observed (if possible) with the exception of SWL pumping in 200 West Area as discussed in Section 3.8. Waste segregation practices are summarized in Table 9 (Fowler, 1995). For projection Case 1, non-complexed and complexed SWL wastes in 200 East Area are mixed for evaporation purposes beginning in FY 2000.

Table 9. Waste Compatibility Matrix

Source Waste Type	Receiver Waste Type: DN	DSSF	DC	CC	(PD) NCRW	PT	NCAW	CP
DN	X	X	X	X	X	X	X	X
DSSF	X	X						
DC			X	X*				
CC			X*	X				
(PD) NCRW SOLIDS	X				X	X		
(PT) PFP SOLIDS	X				X	X		
NCAW							X	
CP								X

(*) Adding CC to DC is permitted but would not ordinarily be done. The volume of combined waste which would need to be evaporated would be increased, resulting in increased evaporation costs.

3.22 Loss of DST Space

Corrosion studies completed to date (Anantatmula and Ohl, 1996) show a 40-60% chance of a pit corrosion failure occurring in a DST by FY 2028. Some of the corrosion potential could be mitigated by maintaining a corrosion control program for the DSTs. In all three projection cases, it was assumed that none of the DSTs would be removed from service by the end of FY 2015.

3.23 New DST Construction

All three projection cases assumed that no new DSTs would be constructed by 2015.

3.24 DST Tank Solids Levels

Solids levels in the DSTs are shown in Table 10 (Hanlon, 1998; Estey and Guthrie, 1996; Stauffer, 1997; and Carothers, 1997b). Solids levels have been estimated for the tanks marked with an asterisk (*) based on the previous solids level measurement and the percent solids in facility generations that have been added to the tank since the last solids level measurement. Tanks with no solids level listed have either not been measured or have a minimal solids volume. The total DST solids used for this projection was approximately 5 Mgal.

Table 10. DST Solids Levels (Kgal)

TANK	SOLIDS	TANK	SOLIDS	TANK	SOLIDS	TANK	SOLIDS
101-AY	108	101-AN	33	101-AP		101-AW	306
102-AY	22	102-AN	89	102-AP		102-AW	40
101-AZ	50	103-AN	410	103-AP	1	103-AW*	487
102-AZ	104	104-AN	449	104-AP		104-AW*	390
101-SY	605	105-AN	489	105-AP	154	105-AW	286
102-SY	123	106-AN	17	106-AP		106-AW	228
103-SY	362	107-AN	247	107-AP			
				108-AP			

3.25 IMUST Wastes

Approximately 500 kilogallons of wastes are projected to be received from Inactive Miscellaneous Underground Storage Tanks (IMUSTs) between FY 2011 and 2015 (Wacek, 1996). This is a new waste type added to these projections.

3.26 Assumption Summary

Assumptions used for all cases are presented in Table 11. Differences in assumptions between the three cases have been highlighted.

Table 11. Assumption Matrix For the 1998 Operational Waste Volume Projection (All Years are Fiscal Years)

	Case 1	Case 2	Case 3
Meets TPA Milestones	Yes	No	No
Facility Generations			
Total Limit, Kgal/mo	15.2-16.6	15.2-16.6	15.2-16.6
PUREX			
Yearly Rate, Kgal/yr	5	5	5
TCO Scheduled	Completed	Completed	Completed
TCO Volume, Kgal	0	0	0
Flush for TCO	---	---	---
WVRF for TCO (to DSSF)	99	99	99
B Plant			
TCO Completed	1998	1998	1998
TCO Volume, Kgal DN	103(remaining)	103(remaining)	103(remaining)
Flush for TCO	10%	10%	10%
WVRF for TCO (to DSSF)	99	99	99
WESF			
Monthly Rate, Kgal/mo	0.5(1998-2028)	0.5(1998-2028)	0.5(1998-2028
Flush for misc. waste	0%	0%	0%
WVRF, misc. waste(to DSSF)	99	99	99
S Plant			
Monthly Rate, Kgal/mo	1.0 to 1.7	1.0 to 1.7	1.0 to 1.7
Flush for misc. waste	22%	22%	22%
WVRF, misc. waste(to DSSF)	99	99	99
T Plant			
Monthly Rate, Kgal/mo	1.4 to 2.7	1.4 to 2.7	1.4 to 2.7
Flush for misc. waste	22%	22%	22%
WVRF, misc. waste(to DSSF)	99	99	99
300 Area			
Monthly Rate, Kgal/mo	2.3 (1998)	2.3 (1998)	2.3 (1998)
Monthly Rate, Kgal/mo	0.33 to 1.4 (1998)	0.33 to 1.4 (1998)	0.33 to 1.4 (1998)
Flush for misc. waste	44%	44%	44%
WVRF, misc. waste(to DSSF)	94	94	94
400 Area			
Rate, Kgal-every 3rd yr	7(1999)	7(1999)	7(1999)
Flush for misc. waste	44%	44%	44%
WVRF, misc. waste(to DSSF)	94	94	94
WSCF			
Monthly Rate, Kgal/mo	0.0	0.0	0.0
Tank Farms			
Monthly Rate, Kgal/mo	10	10	10
WVRF, flushes (to DSSF)	99	99	99

Table 11. Assumption Matrix For the 1998 Operational Waste Volume Projection (continued)

	Case 1	Case 2	Case 3
IMUST Wastes			
Tot. Volume, Kgal (2011-15)	500	500	500
100 Area			
100-N			
TCO Scheduled	1998	1998	1998
TCO Waste Received	N/A-send to ERDF	N/A-send to ERDF	N/A-send to ERDF
TCO Volume, Kgal	0	0	0
100-K Basin Cleanout			
TCO Scheduled	2003	2003	2003
TCO Volume, Kgal	350	350	350
105-F & 105-H Basin			
TCO waste in 2000, Kgal	40	40	40
TCO waste in 2005, Kgal	200	200	200
Flush, ALL 100 Area Waste	44%	44%	44%
WVRF, ALL TCO waste(to DSSF)	99	99	99
Tank 107-AN Caustic Addition			
Addition in FY 2000 (Kgal)	66	66	66
Salt Well Liquid Pumping			
Volume remaining (Mgal)	5.36	5.36	5.36
Volume to be pumped in 1998	0.24	0.24	0.24
West Area Receiver	Tank 102-SY	Tank 102-SY	Tank 102-SY
Start Complexed SWL in 200W	1999	2002	2002
Pumping Completion, FY	2000	2004	2004
Dilute Complexed SWL (Mgal)	1.64	1.64	1.64
Porosity saltcake/sludge	50%/21%	50%/21%	50%/21%
Flush for SWL Pumping	28%	28%	28%
WVRF, non-complexed (to DSSF)	47	47	47
WVRF, complexed (to DSSF)	10	10	10
Single-Shell Tank (SST) Solids			
Tank 106-C Retrieval	9/1998	9/1998	9/1998
Tank 104-C Retrieval	8/2004	3/2005	3/2005
# Tanks to store 106-C solids	1	1	1
Start Remaining SST Retvl	2004	N/A	2004
Tank Farm Closure start	2018	N/A	2018
Approximate Dilution Ratio	3:1	3:1	3:1
Retrieved Vol 2004-2005(Mgal)	2.8	N/A	2.8
Retrieved Vol 2006-2007(Mgal)	3.6	N/A	3.6
Meets TPA Milestones	Yes	N/A	Yes
No. SSTs Retrieved	149	N/A	149
Sludge Retrieved (Mgal)	12.2	12.2	12.2
Saltcake Retrieved (Mgal)	23.4	23.4	23.4

Table 11. Assumption Matrix
For the 1998 Operational Waste Volume Projection
(continued)

	Case 1	Case 2	Case 3
PFP Stabilization			
Dates	1998-2006	1998-2006	1998-2006
Volume, Kgal	27	27	27
Flush	22%	22%	22%
WVRF	81	81	81
Evaporator			
242-A Shutdown	~2011	~2011	~2011
New Evaporator (Privatize)	2011	2011	2011
Next Outage Date	2004 (1 Yr)	2004 (1 Yr)	2004 (1 Yr)
Training Vol. (bi-yearly)	50	50	50
Ave. Evap Rate, Kgal/mo	500	500	500
Evaporation Product	dDSSF	dDSSF	dDSSF
Evaporation Limit (g/ml)	1.41	1.41	1.41
LERF capacity (Mgal)	13	13	13
Gal. condensate/gal. WVR	1.20	1.20	1.20
Yearly evaporation of DN (except for scheduled outage)	Yes	Yes	Yes
Effluent Treatment Facility			
Rate (Mgal/year)	50	50	50
Watch List/Safety			
101-SY Retrieval	1/2007	1/2008	1/2008
103-SY Retrieval	8/2007	4/2010	4/2010
Spare/Contingency Space			
Spare Space, Mgal	2.28	2.28	2.28
Use 0.72 Mgal of Operational space in 106-AW as part of spare space from 1999 on	Yes	Yes	Yes
Contingency space, Mgal	None	None	None
-date	N/A	N/A	N/A
Waste Segregation/DST Solids			
Total DST solids (Mgal)	5	5	5
Store DSSF on NCRW solids	Yes	Yes	Yes
Store DSSF on NCAW solids	No	No	No
Segregate Complexed wastes	If Possible	If Possible	If Possible
Loss of DST Space			
Number Tanks Removed from Service	None	None	None
New DST Construction	None	None	None
Date Constructed	N/A	N/A	N/A
New Cross-Site Transfer Line			
Start Construction (TPA)	11/1995	11/1995	11/1995
New line operational	Yes	Yes	Yes
Old line operational	Yes	Yes	Yes

Table 11. Assumption Matrix
For the 1998 Operational Waste Volume Projection
(continued)

	Case 1	Case 2	Case 3
DST Retrieval			
102-SY solids retrieved to 200 East Area	1/2006	1/2008	1/2008
Consolidation of NCRW solids in 103-AW & 105-AW	No	No	No
Phase 1B Privatization Processing			
HLW Processing start	11/2000	6/2004	6/2004
HLW Vitrification start	6/2002	11/2004	11/2004
LAW Processing start	6/2002	6/2004	6/2004
LAW Vitrification start	6/2002	5/2006	5/2006
Phase 1 treatment ends	6/2011	12/2016(extended)	12/2016(extended)
Phase 1 Extension	Yes - Through Maximum Order Quantities	Yes - Through FY 2016	Yes - Through FY 2016
LAW Delivery Rate	1460 MT Na/yr	1100 MT Na/yr	1100 MT Na/yr
HLW Delivery Rate	60 MT NVOL/yr	92 MT NVOL/yr	92 MT NVOL/yr
Total Processed Quantities:			
Envelope A (MT Na)	~5399	~7010	~7010
Envelope B (MT Na)	~ 234	~ 556	~ 556
Envelope C (MT Na)	~4577	~4310	~4310
Staging/Characterization time per tank	100 days	100 days	100 days
Approximate Concentration of retrieved DSSF, CC	7 M, Na	7 M, Na	7 M, Na
LAW Retrieval Schedule--Dates to stage first five batches:			
Batch 1	105-AN(3/2001)	107-AN(7/2005)	107-AN(7/2005)
Batch 2	104-AN(10/2001)	105-AN(7/2006)	105-AN(7/2006)
Batch 3	101-AW(1/2003)	102-AN(3/2007)	102-AN(3/2007)
Batch 4	103-AN(10/2003)	104-AN(12/2007)	104-AN(12/2007)
Batch 5	101-AP & 104-AW(5/2004)	101-AW(10/2008)	101-AW(10/2008)
Intermediate Feed Staging Tank	2	2	2
Number of LAW Contractors	2	1	1
Vendor Feed Tank	2	1	1
Pretreated NCAW Receipt Tank	0	1	1
NCAW supernatant prestage Tank	1	0	0
Entr. Solid Receipt Tanks	1	1	1
Phase 2 Privatization Processing			
Contract Award	2005	N/A	N/A
LAW Operations	2011-2021	N/A	N/A
HLW Operations	2013-2028	N/A	N/A
HLW Return Tanks	3	3	3
Includes New Evaporator	Yes	Yes	Yes
Step Processing Rates--1/3 first year; 2/3 second year; then full rate			
Maximum Processing Rates			
LAW, Mgal/yr @7M Na	17.2	N/A	N/A
LAW, Mgal/yr @5M Na	24.1	N/A	N/A
HLW, Mgal/yr @5M Na	1.55	N/A	N/A
In-Tank Washing			
In-tank Washing of NCAW	Yes	No	No
Consolid. of NCAW solids	No	No	No

4.0 ASSUMPTIONS FOR PROJECTION CASES 2 AND 3

Case 1 (TPA Compliant) is meant to project DST needs based on established TPA milestones, TWRS program planning, and the most realistic operational assumptions (described in Section 3). Case 1 presents a basis for evaluating future DST space needs through the end of FY 2015. This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional double-shell tanks. This document presents the results of three projections cases. Operating assumptions for the three projection cases were established by July 1998.

The Case 2 and Case 3 projections present a range of operational assumptions meant to determine the impact of changes in the disposal program on DST needs. The Case 2 and Case 3 projections do not present a lower or an upper limit on double-shell tank needs which could vary significantly depending on the assumption changes.The following section will describe assumptions specific to the Case 2 and Case 3 projections. These assumptions are also summarized in Table 11.

Projection Case 2 presents projected DST space needs based on the May 27, 1998 Alternative Case (DeLozier, 1998) without SST solids retrieval. Case 2 delivers additional feed beyond the minium order quantities through FY 2016. The May 27, 1998 Alternative Case included a treatment schedule being considered for privatization and an alternative SWL pumping schedule (Ross, 1998). One of the purposes of this projection was to identify the space available for SST solids retrieval. Projection Case 3 uses the same assumptions for retrieval and SWL pumping as Case 2 but also includes the TPA compliant SST solids retrieval schedule from Case 1. Additional details of the assumptions for these projection cases are included in the following sections.

4.1 Projection Case 2 Assumptions

Assumptions for projection Case 2 are the same as those for the Case 1 except for the following:

- Alternative Treatment Schedule. The extended treatment schedule used in this projection (Waldo, 1998 and Peters, 1998) was designed to identify how much DST space would be freed up if the alternative treatment schedule (DeLozier, 1998) was extended thru FY 2016. One of the purposes of this projection was to identify the space available for SST solids retrieval. For this reason, this projection did not include any SST solids retrieval other than the retrieval of solids from Tanks 106-C and 104-C. These solids were projected to be retrieved to Tank 102-AY. The schedule used for processing of LAW is summarized in Table 12.

Table 12. Projected Processing Schedule for Case 2

Tank	Waste Type	Envelope	Volume with solids (Kgal)	Approximate Quantity of Na Delivered (MT Na)	Existing or Future Waste	End Transfer Date for Processing
107-AN	CC	C	1057	~ 782	Existing	7/2005
105-AN	DSSF	A	1128	~1027	Existing	7/2006
102-AN	CC	C	1079	~ 954	Existing	3/2007
104-AN	DSSF	A	1057	~1070	Existing	12/2007
101-AW	DSSF	A	1128	~ 856	Existing	10/2008
103-AN	DSS	A	957	~1170	Existing	7/2009
108-AP	NCAW Supernate (101-AZ,102-AZ)	B	978	~ 556	Existing	4/2011
101-SY	CC	C	1114	~1230	Existing	3/2008
103-SY	CC	C	747	~ 789	Existing	10/2011
103-AP	CC	C	1111	~ 898	Future	3/2013
101-AN	DSSF	A	1080	~ 912	Future	12/2013
101-AP	DSSF	A	1112	~ 956	Future	10/2014
105-AP	DSSF	A	1106	~ 804	Future	7/2015
107-AN	DSSF	A	1000	~ 700	Future	2/2016

The alternative treatment schedule considered for privatization in May 1998 (DeLozier, 1998) did not include direction on Phase 2 waste treatment. Since projection cases 2 and 3 included an extension of Phase 1 processing into FY 2016, no Phase 2 waste treatment was considered. Note that feeds in the table above listed after Tank 108-AP (NCAW supernates) are extensions beyond the Phase 1 minimum order quantities.

The May 1998 treatment schedule (DeLozier, 1998) also included a number of other key changes as compared to Case 1 that are summarized below:

1. No in-tank washing of NCAW solids. It was assumed that NCAW slurries would be transferred to the privatization contractor who would perform any solids/liquid separations and washing. It was assumed that the NCAW supernate would be returned to Tank 108-AP.

2. Only one tank would be used to feed wastes to the contractor--Tank 106-AP.

3. Envelope limits were modified.

- <u>SWL Pumping Volume</u>. For projection Cases 2 and 3, it was assumed that SWL pumping would be completed by the end of FY 2004 (Ross, 1998). The projected pumping volumes (without flush) for Cases 2 and 3 are presented in Table 13. Cases 2 and 3 used the same amount of flush (approximately 1.53 Mgal) and the same WVRFs that were listed for Case 1 in Section 3.8.

Table 13. Salt Well Pumping Schedule for Case 2

Salt Well Pumping Schedule for 50% Saltcake/21% Sludge Porosity (Brown, 1996)					
FISCAL YEAR	EAST AREA		WEST AREA		TOTALS
	DN	DC	DN	DC	
Projected SWL Pumping 1998-2000 (without flush)					
1998	0 KGAL	0 KGAL	238 KGAL	0 KGAL	238 KGAL
1999	0 KGAL	38 KGAL	730 KGAL	0 KGAL	768 KGAL
2000	597 KGAL	398 KGAL	332 KGAL	0 KGAL	1327 KGAL
2001	206 KGAL	260 KGAL	551 KGAL	0 KGAL	1017 KGAL
2002	15 KGAL	67 KGAL	577 KGAL	182 KGAL	841 KGAL
2003	0 KGAL	0 KGAL	499 KGAL	577 KGAL	1076 KGAL
2004	0 KGAL	0 KGAL	1 KGAL	115 KGAL	116 KGAL
TOTALS	818 KGAL	763 KGAL	2908 KGAL	874 KGAL	5363 KGAL

4.2 Projection Case 3 Assumptions

Assumptions for the Case 3 projection are the same as those for the Case 2 projection except that the Case 3 projection includes the TPA compliant SST solids retrieval schedule defined for Case 1 (see Section 3.9). This retrieval schedule for SST solids was based on a file received from Disposal Engineering (Penwell, 1998a) which started retrieval in December 2003 (M-45-03-T1) and completed retrieval by the end of FY 2018 (TPA milestone). The retrieved volume of waste for this case is approximately 2.8 Mgal for FY 2004-2005 and an additional 3.6 Mgal for FY 2006-2007.

5.0 RESULTS AND CONCLUSIONS

The results of a waste volume projection can be used to forecast tank space needs versus time, forecast evaporator operation, forecast needed LAW processing and disposal rates, HLW processing and disposal, analyze tank space issues for aging and non-aging waste tanks, predict tank usage, or to determine the need and schedule for retrievals or cross-site transfers. To predict tank space needs, a graphic is produced showing tank count versus time as compared to the available space. Generations and evaporations for the near term (thru 2000) are modeled on a monthly basis whereas the remainder of the projection is typically modeled on an annual basis.

All projection cases assume that dilute waste will be evaporated to DSSF in the year they are produced, provided an evaporator is operational and the WVR limit of the evaporator has not been exceeded. In later parts of the projections when tank space becomes tight due to processing needs and/or the amount of SST solids being retrieved, the evaporator is assumed to operate yearly even if volumes are small in order to minimize waste storage needs. Long range projection graphics for the three projection cases are presented in Sections 5.1, 5.2, and 5.3. Short range graphics, tank usage graphics, evaporator WVR data, and a spreadsheet showing inputs/outputs have been included for the Case 1 projection (TPA Compliant) only.

This year's projection cases incorporate several space saving assumptions. These space saving alternatives reduce the need to build additional DSTs but add additional risks to the TWRS program. These actions and some of the risks are listed below:

- Waste generation rates and TCO volumes have been reduced compared to those used in Rev. 23.

- It was assumed that agitation using a mixer pump would continue to be used for mitigation of the flammable gas buildup in Tank 101-SY. It was assumed that neither Tank 101-SY or 103-SY would require dilution until just prior to retrieval for processing during Phase 1B processing.

  If the mixer pump option was not available to meet the flammable gas buildup and a 1:1 dilution was required at a future date the increase in tank space to dilute both Tanks 101-SY and 103-SY would be approximately 1.9 million gallons.

- In Revision 21 of this document, it was assumed that all NCRW and PFP solids could be consolidated into one DST (Awadalla, 1995). In Revs. 22 and 23 of this document, it was assumed that the solids in Tanks 103-AW and 105-AW would not be combined. However, the PFP solids from Tank 102-SY and the solids from the 100 Area TCO activities were combined into Tank 105-AW. To further minimize the impact of this non consolidation of solids compared to Revision 21, this year's projections assumed that slurry feed (DSSF) could be stored on top of the solids in Tanks 103-AW and 104-AW. The acceptability of this assumption is still being reviewed.

- Spare space is space reserved in case of a leak in a double-shell tank per DOE Order 5820.2A. Contingency space has historically been set aside to account for possible inaccuracies in the WVP software when projecting waste generations and/or waste volume reduction factors. A total of 2.28 million gallons (one aging and one non-aging tank) of spare/contingency space was reserved for all three projection cases. This space is distributed space from FY 1999 on. Operational space in Tanks 102-AW and 106-AW was used to provide 0.72 Mgal of the required 2.28 Mgal of spare/contingency space from FY 1999 on (Awadalla, 1995). This assumption change reduces operational space which may create operational/space problems during the period when SST solids are being retrieved.

- Tank 102-SY was used to pump complexed SWL in West area starting in FY 2000 for Case 1 in order to meet TPA milestones for SWL pumping completion. Retrieval of the TRU solids in this tank is not scheduled until January 2006 (Case 1) or until January 2008 (Cases 2 and 3). Segregation issues involving contacting complexed SWL with the TRU heel in Tank 102-SY may make this assumption impossible which could delay SWL pumping TPA milestones (see Section 3.8 for more on SWL pumping).

- These projections assumed that dilute non-complexed waste could be evaporated to a specific gravity (SpG) of 1.41 rather than the previous 1.35 limit used in the 1995 projection, L9503A (Awadalla, 1995). Analysis has shown that as long as the SpG remains at 1.41 or less that there will not be a buildup of flammable gas in the DSTs (Fowler, 1995). Evaporating the waste to a SpG of 1.41 would save approximately 2/3 of a tank by the end of the projection as compared to the 1995 projection, L9503A.

- Some double-shell tanks are nearing their design life. None of this year's projections provide for the loss of any DST space through 2015. The volume of this impact would be approximately one million gallons if one DST is lost. Spare space would be used if a loss of a double-shell tank should occur.

- All three projections assumed that evaporator capacity would be available on an annual basis from FY 1998-2015 except for a one year outage in FY 2004. A reduction in evaporation capacity during years when space is tight or when waste receipts are high could result in a tank space shortage.

- The Privatization contracts state that each Privatization Contractor will modify their assigned feed tank (Tank 106-AP or Tank 108-AP) and supporting systems. Due to DST tank space limitations, the current feed staging plans and OWVP projections continue to use these tanks for waste management during the same time frame that tank modifications and turnover are expected to occur.

- The PHMC team will need to use Tanks 102-AP and 104-AP for waste management during the same time frame that Project W-211 is preparing them for use as intermediate feed staging tanks.

- All three projection cases assume that timely permission is obtained to remove waste from watch-list tanks used as LAW feed sources and to remove the watch-list designation from that tank immediately after retrieval. This means that tanks are immediately available for unrestricted use.

The space saving actions listed above reduce the need for construction of new DST space that was recommended based on a previous projection (Rev. 20) but introduce additional uncertainties and risks into the overall TWRS program. If many of these items are not possible or if waste generations exceed those used in this projection, it may be necessary to either delay site cleanup activities, delay TPA milestones (e.g., SWL pumping and/or SST solids retrieval), increase the waste processing rate, or build additional tank space in order to avoid exceeding the available DST space. Additional studies are currently in progress to address and solve the issues that have been identified.

Results of the projection cases and the projected tank space needs are included in the following sections.

5.1 Projection Case 1 Results and Conclusions

Assumptions for the Case 1 projection represent the current planning basis for TWRS programs to meet TPA commitments. Projected tank space needs for the Case 1 projection are shown in Figure 3. The Case 1 projection exceeds available space by one tank in FY 2001, by up to two tanks in FY 2005-2007, and by up to seven tanks by FY 2012. The one tank space shortage in FY 2001 could be eliminated by using fewer tanks to pump SWL in 200 East Area. This projection assumed that Tanks 101-AN and 106-AP would be used to pump non-complexed waste in 200 East Area while Tank 108-AP would be used to pump complexed SWL in 200 East Area. Pumping the non-complexed SWL to one tank in 200 East Area would free up one tank for storage of the DSSF being produced, thus eliminating the one tank shortage. The tank space shortage in FY 2005-2006 results from trying to retrieve a relatively large volume of SST solids through Tank 102-SY before the TRU solids residing in Tank 102-SY have been removed and at a time when Tank 102-SY is being used to retrieve wastes from Tanks 101-SY and 103-SY. Options to meet or avoid the need for extra space in 200 West Area during FY 2005-2006 include the following:

- Accelerate both the removal of the TRU solids from the bottom of Tank 102-SY and the retrieval of wastes from Tanks 101-SY and 103-SY to a date preceding the start of SST solids retrieval in 200 West Area (FY 2007). This should provide space in Tank 102-SY to handle the early SST solids retrieval schedule. This could also mean that the wastes in Tanks 101-SY and 103-SY would have to be pretreated at an earlier date in the Phase 1B schedule.

- Reduce the amount of SST solids waste retrieved in 200 West Area until after Tank 102-SY has been cleaned out and Tanks 101-SY and 103-SY have been retrieved (after August 2007) and/or reduce the SST solids retrieval schedule (may delay TPA milestones).

- Delay SWL pumping to reduce tank space needs (delays TPA milestone). One of the 200 West Area tanks would still have to be diluted and moved to 200 East Area to provide space where it is needed. This means that up to 2.8 million gallons of SWL (assumed WVRF of 47%) might have to be delayed to accommodate the diluted volume of Tank 103-SY (current inventory 747 Kgal; assumed 1:1 dilution).

- Increase Phase 1B processing rates to free up additional tank space. Since the space is needed in West Area, one of the tanks in West Area would have to be moved earlier in the Phase 1B schedule. Tank 103-SY has only a total of 747 Kgal and the final diluted volume would be smaller.

- Build additional tanks. Should the projection require building new tanks, approximately six to eight years lead time would be required to provide additional storage tanks. Since we have the lead time, the decision to add storage capacity can be delayed until tank space needs are re-evaluated in 1999. Annual evaluation of tank space needs and the decisions on additional storage capacity are required by the M-46 series Tri-Party Agreement Milestones.

Options to meet or avoid the need for extra space needed during FY 2011-2015 include the following:

- o Reduce the amount of SST solids waste retrieval volume during FY 2011-2015 (may delay TPA milestones). The SST solids retrieval schedule used for projection Cases 1 and 3 would retrieve 10.9 Mgal more waste by the end of FY 2013 than the schedule used for the 1997 OWVP. There is still ample time in future years to thoroughly review the SST solids retrieval schedule to avoid some of this shortage.
- o Delay SWL pumping to reduce tank space (delays TPA milestones).
- o Increase Phase 1B and/or Phase 2 processing rates to free up additional tank space.
- o Build additional tanks.

A spreadsheet summarizing the waste generations, evaporator WVR, and processing requirements for the Case 1 projection has been added to this document and is included as Table 14. This spreadsheet is included to present a global view of how the various inputs and outputs affect tank space. This spreadsheet is useful to review waste inventories and waste receipts but cannot accurately predict the dynamics of tank usage or the full impact of partially filled tanks on tank space needs. Information on the amount and nature of HLW returns to the aging waste tanks was not available when these projections were completed. The HLW return volumes and workoffs shown in this document are estimates only and are likely to change.

The projected tank inventories and tank space usage for the Case 1 projection (TPA Compliant) as of September 2001 are included in Table 15.

Figure 4 shows the waste additions and available space in a bar graph format to allow the user to more easily visualize the tank space usage. Numbered comments have been added to the bar graph explaining the inventory changes. These comments follow the figure. During the period when SST solids are being retrieved and pretreated (full Phase 2 processing rate will pretreat a full tank of SST solids waste in less than one month), some of the tanks are being filled and pretreated (up to twice) within the same fiscal year. These tanks will show up as "empty" in the graphic because they have been filled and pretreated within the same fiscal year and their inventory at the end of the year has been reduced to a heel. Thus, the bar graph misleads the user into believing that most of the space dedicated to SST solids retrieval is not needed. The space is actually needed to allow staging and processing of the SST solids wastes. Retrieval and processing rates are high enough in FY 2011-2015 that it is difficult to retrieve the wastes, allow the 100 days assumed for characterization, and pretreat at the specified processing rate.

No new tanks are needed in the next 6-8 years but tank space is critical in the FY 2005-2006 timeframes if some of the space saving options mentioned above are exercised. Space saving options will continue to be reviewed. It takes 6-8 years to build additional tanks so the tight space seen in the 2005-2006 timeframe will be monitored closely next year to see if new tanks are needed. Several options are being investigated and reviewed for next year's submittal of the OWVP.

Efforts will be made next fiscal year to accelerate retrieval of the tanks in SY farm earlier as mentioned in the above options. This action will not impact TPA milestones. The other options will also be looked at further. By completing one of the options, the projected tank space needs could be reduced to fit the available space. Lockheed Martin Hanford Company is concerned about the projected tank space shortage in FY 2011-2015 and beyond but appropriate time is available to review the assumptions and projected tank space in later years.

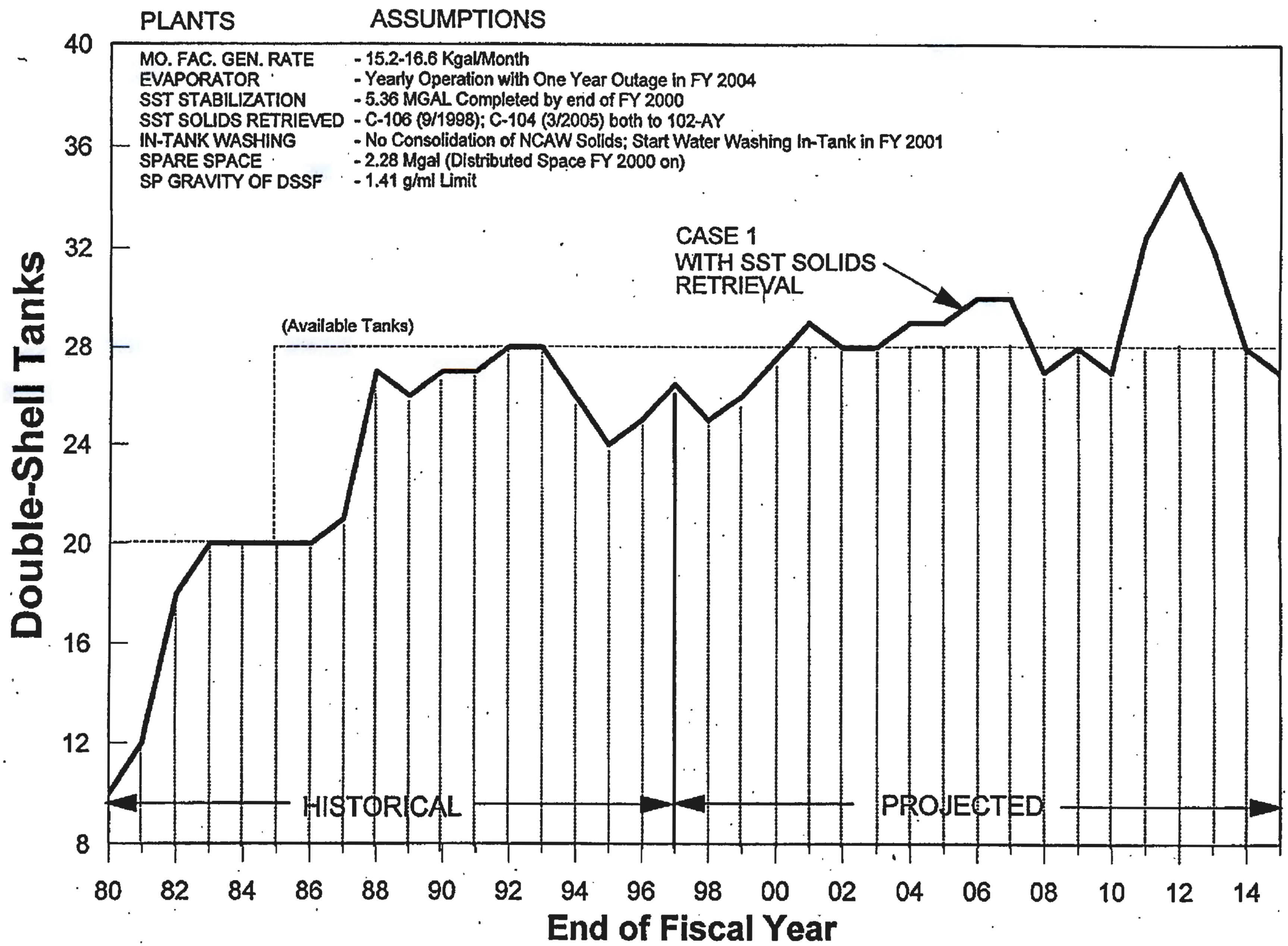


Figure 3. Double-Shell Tank Requirements for Case 1--TPA Compliant

OF3

Table 14. Spreadsheet of Waste Additions and Reductions for Case 1

FISCAL YEAR	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
STARTING INVENTORY	19048	18353	18572	19735	23043	23384	23419	22713	23955	23025	21318	23516	21845	21575	24049	28590	29144	24504	18078
SPACE UTILIZATION																			
Spare Space	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280
Watchlist Space	702	702	702	691	691	606	924	411	411	411	0	0	0	0	0	0	0	0	0
Contingency Space	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Segregated Space	2493	3350	2730	1064	2123	2603	2873	2023	1902	2795	1751	963	30	30	80	0	0	0	0
Priority Operational Space	3042	2261	2373	4435	4329	4452	4380	4609	5803	6493	6003	6355	4120	3932	4882	6719	10298	12245	17854
NEW WASTE ADDITIONS																			
B Plant/WSCF	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S Plant	4	20	16	16	16	15	15	15	15	15	15	12	12	12	12	12	12	12	12
T Plant	14	17	17	24	24	24	25	25	25	25	26	26	26	27	27	27	27	28	28
300/400 Areas	16	28	23	5	4	12	5	5	12	5	5	12	5	5	12	5	5	12	5
TCO	38	109	5	45	5	5	355	5	205	5	5	5	5	5	5	5	5	5	5
Flushes	327	100	635	1102	212	49	184	10	100	110	110	112	109	109	112	109	109	112	109
SWL Pumping	131	237	1813	3346	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tank Farms	75	170	190	180	225	205	200	170	155	205	155	205	155	205	155	205	155	205	155
SST Retrieval	0	0	750	0	0	0	0	2217	1199	839	2771	1410	1742	2417	8644	13529	16483	15861	12362
PFP	0	5	12	3	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Inventory	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retrieval Water	0	0	0	0	0	0	0	0	0	426	0	0	0	0	0	0	0	0	0
Everything Else	64	5	175	5	5	14	50	373	122	59	14	5	21	5	105	105	105	105	105
Pretreatment Dilution	0	0	0	0	326	428	653	709	0	626	1436	0	0	0	0	0	0	0	0
In-Tank Washing	0	0	0	146	647	750	1155	0	0	0	826	0	0	0	0	0	0	0	0
NEW WASTE ADDITIONS TOTAL	681	691	3636	4938	1466	1503	2643	3530	1834	2316	5363	1787	2075	2785	9072	13997	16901	16340	12781
TOTAL WASTE BEFORE EVAP	19729	19044	22207	24674	24509	24887	26062	26243	25789	25341	26680	25304	23920	24361	33121	42586	46044	40846	30858
EVAPORATOR WVR	-1074	-72	-2472	-1631	-1125	-668	-1033	0	-642	-1714	-586	-982	-361	-312	-350	-334	-389	-338	-395
CUM EVAPORATOR WVR	-1074	-1146	-3618	-5249	-6374	-7042	-8075	-8075	-8717	-10431	-11017	-11999	-12360	-12672	-13022	-13356	-13745	-14083	-14478
Loss due to Change of Instruments	-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loss due to (Burp, Lance Evap, Surface Change, Inst, etc.)	-276	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Outflow to SST Wash Facility	0	-400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Adjust waste layers due to new solids meas.	-11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low activity waste	0	0	0	0	0	-651	-1999	-2120	-1973	-2011	-2288	-2319	-1668	0	-4181	-13108	-21151	-22430	-21302
High Level Waste Contractor	0	0	0	0	0	-149	-317	-168	-149	-298	-290	-158	-316	0	0	0	0	0	0
EVAP AND OUTFLOWS TOTAL:	-1376	-472	-2472	-1631	-1125	-1468	-3349	-2288	-2764	-4023	-3164	-3459	-2345	-312	-4531	-13442	-21540	-22768	-21697
NET INVENTORY CHANGE	-695	219	1164	3307	341	35	-706	1242	-930	-1707	2199	-1672	-270	2473	4541	555	-4639	-6428	-8916
END OF YEAR INVENTORY	18353	18572	19735	23043	23384	23419	22713	23955	23025	21318	23516	21845	21575	24049	28590	29144	24504	18078	9161
TOTAL CAPACITY	26870	27165	27820	31513	32607	33360	33170	33278	33421	33297	33550	31443	28005	30291	35782	38143	37082	32603	29295
	24	24	25	28	29	30	30	30	30	30	30	28	25	27	32	34	33	29	26

** Evaporation of 72 kGal in FY98 is the in-tank evaporation of Tank 102-AZ*

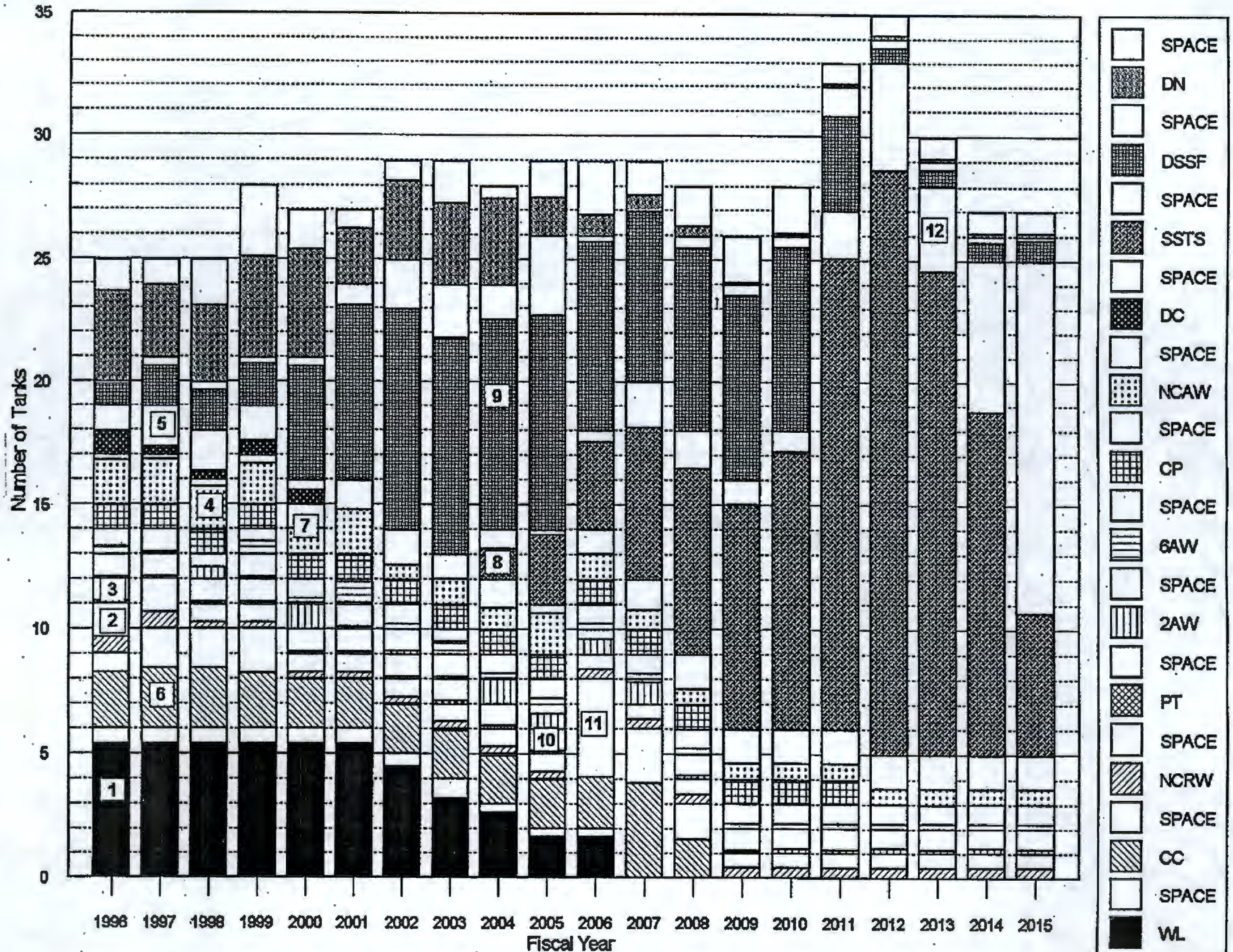


Figure 4. Double-Shell Tank Inventory and Space for the Case 1 Projection

Comments for Figure 4--Double-Shell Tank Inventory and Space for the TPA Compliant Case

This bar chart graphic is meant to show the increase and decrease in the various waste categories or waste types for this year's Case 1 projection. Tank space needs for "in-tank washing" have been included. Spare and processing receipt tanks are not shown. Beginning in 1999, a portion of the evaporator operational space maintained in Tanks 102-AW and 106-AW (abbreviated 2AW and 6AW on Figure 4) will also be considered as spare space to decrease tank space needs. Levels of Dilute Non-complexed waste (DN) in the dilute receiver and evaporator tanks will vary with time. The bar for each year depicts the tank space needs for the end of that fiscal year and may not show tank space changes occurring during the fiscal year, especially if the tank inventory has been removed prior to the end of the fiscal year.

Numbered Comments for "Tank Inventory and Space" Graphic

1. "Watch List" (WL) tank inventories are constant from 1995-2000. In FY 2001, the contents of Tank 105-AN are diluted and transferred to the intermediate staging tanks to supply feed for Phase 1B processing.

2. Space above Neutralized Cladding Removal Waste (NCRW) solids is routinely used to store Dilute Non-complexed (DN) waste. For clarity, the graph shows this DN inventory in with the other DN inventory toward the top of the graph. (i.e, to ascertain "free" space, add the space shown in the NCRW group to that shown in the DN group).

3. Space above PFP Tru (PT) solids is used to store DN waste, (see note 2). It is assumed that complexed salt well liquid pumping in 200 West Area would be added to Tank 102-SY before the PT (PFP TRU) solids were retrieved (see note 9).

4. The slight decrease in the NCAW category from 1997-2002 is caused by in-tank concentration of the NCAW supernates.

5. In 1997 there is an increase in space above the Dilute Complexed (DC) waste inventory. This results from pumping the DC waste from Tank 101-AY (980 Kgal) to other tanks prior to and during evaporation (Tanks 108-AP, 106-AN, and 102-AW), thus creating more net headspace. Reduction in the DC waste inventory in 1997 was caused by an evaporation. Evaporation is necessary to cleanout Tank 101-AY for pre-staging of Envelope B feed and to reduce storage volume.

6. The CC (or DSSF) group shows increases in inventory over time due to the evaporation of dilute complexed wastes. When a CC tank becomes full, a new tank must be added, which obviously has empty space in it. This is shown graphically year-to-year with step increases in the number of CC tanks and variations in the available space shown in the group. Increase in CC volumes occur due to Salt Well Liquid (SWL) pumping. In 2005, the large increase in the number of tanks in the CC group is caused by staging CC wastes into the processing staging tanks.

7. The changes in NCAW inventory and tank needs starting in 2000 were partially caused by in-tank washing of the NCAW solids. The final result of the operations were completed by the end of FY 2006 but the NCAW solids vitrification is not completed until FY 2009 (See Table 6 for additional detail). The increase in tank count in FY 2004 is caused by staging aging waste supernate into processing feed tanks which are then temporarily counted as part of this group. The increase in inventory from 2009 on is caused by the slow accumulation of either Sr/TRU entrained solids.

8. Retrieval of Single-Shell Tank (SST) solids was started in FY 2004. Initial SST solids were stored in Tanks 101-AN and 102-SY.

9. Decrease in DSSF inventory in FY 2004 results from Phase 1B processing. The DSSF category actually shows a slight increase in inventory and tank count as waste staging occurs in FY 2002-2003. By 2004, the workoff due to processing has decreased the inventory and tank count.

10. The PT (PFP TRU) solids from Tank 102-SY were cross-sited to Tank 105-AW beginning January 2006. Therefore, the PT waste category and space are eliminated in FY 2006.

11. Increase in CC inventory and tank count in 2006 is caused by dilution and staging of watch list waste from Tank 107-AN for processing in Phase 1B. The tank count remains at a high level for the CC group (staging tanks classified as CC group during use) until CC wastes have been worked off.

12. By FY 2013, the Phase 2 processing is operating at full capacity and is working off wastes faster than SST solids volumes are being retrieved. All the tanks in the SST Solids (SSTS) category contained waste at some time during the year (some have been filled and emptied twice) but by the end of the Fiscal Year the tanks happen to be empty and the ending inventory is much lower than the tank capacity for this group. Thus, the bar graph misleads the user into believing that most of the space dedicated to SST solids retrieval is not needed. The space is actually needed to allow staging and processing of the SST solids wastes. Retrieval and processing rates are high enough in FY 2014-2015 that it is difficult to retrieve the wastes, allow the 100 days assumed for characterization, and pretreat at the specified processing rate.

Table 15. Projected Tank Usage on 9/2001 for the Case 1 Projection

Tank	Liquid (Kgal)	Solids (Kgal)	Total (Kgal)	Comment/Projected Usage for Tank as of 9/2001
101-AY	892	108	1000	Received NCAW supernate from 1AZ starting 8/2000 & from 2AZ starting 9/2001
102-AY	955	22	977	Received C-106 solids starting 9/1998
101-AZ	296	50	346	Start in-tank washing 8/2000 by decanting to 1AY
102-AZ	290	104	394	Start in-tank washing 9/2001 by decanting to 1AY
101-SY	516	605	1121	CC/SL inventory; watch list (WL) tank
102-SY	823	123	946	DN/PT inventory; 200 West Area SWL and dilute receiver
103-SY	386	362	748	CC/SL inventory; WL tank
101-AW	820	306	1126	DSSF/SL inventory; WL tank; third tank to be pretreated
102-AW	63	40	103	Evaporator feed tank
103-AW	653	487	1140	DSSF/PD solids; "topped off" w/ DSSF in 10/1999
104-AW	750	390	1140	Refilled w/ DSSF in FY 2000
105-AW	117	286	403	DN heel/PD solids; receives all 100 Area wastes & solids from 9/1997-2005; dilute receiver FY 2001
106-AW	803	228	1031	Evaporator slurry receiver tank
101-AN	150	33	183	SWL-DC receiver until end of FY 2000
102-AN	984	89	1073	CC (TRU) inventory
103-AN	549	410	959	DSS inventory; WL tank
104-AN	606	449	1055	DSSF inventory; WL tank; second tank to be pretreated
105-AN	619	489	1108	DSSF inventory; WL tank; first tank to be pretreated; 200 East Area dilute receiver FY 2002 on
106-AN	1093	17	1110	Received CP waste from 2AP in 5/2000
107-AN	872	247	1119	CC (TRU)/SL inventory
101-AP	1140		1140	Filled w/ DSSF by 9/2000
102-AP	28		28	SF inventory; processing intermediate staging tank FY 2001 on; heel in tank residual from 5AN which was transferred to 6AP
103-AP	1139	1	1140	Spare tank until 3/1999; receives concentrated waste early FY 1999 on
104-AP	28		28	Stage DN for evaporation until 9/2000; processing intermediate staging tank 10/2000 on; residual heel in tank from 4AN which was moved to 8AP
105-AP	986	154	1140	Filled w/ DSSF by 2/2000;
106-AP	755	4	759	SWL-DN receiver and dilute receiver in E. Area until 10/2000; vendor staging tank 10/2000 on
107-AP	329		329	Stage DN for evaporation; entrained solids return tank from 6/2002 on
108-AP	748	8	756	Stage DC for evaporation; vendor staging tank 10/2000 on

Interpretation of Short Range Projection Results

This section provides an interpretation of detailed short range projection results. The OWVP presents certain information in the form of graphics. A number of these graphics show 12 months of historical operations and 24 months of projected operations. Most of the vertical axis represents thousands of gallons of waste generated. An example of this type of graphic is the facility waste generation graphic. The volume generated per month for each facility is depicted on a facility waste generation graph. An example of the facility waste generation graph for PUREX waste is shown below (Figure 5).

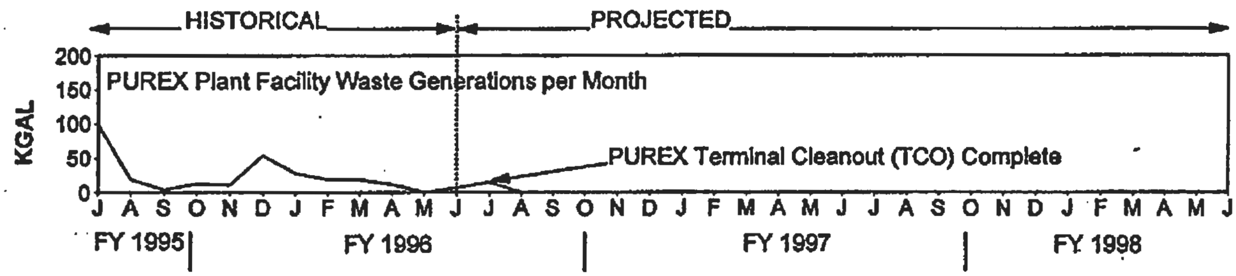


Figure 5. Facility Waste Generation Graphic

In the computer simulation, facility waste streams are routed to a receiver tank. A tank fill graphic shows the filling of the receiver tank and is on the same page as the facility waste generation graph of the waste stream it receives. The tank fill graphic shows the rate a specific tank is filled with waste. Usually when a receiver tank is full, waste is transferred to a holding tank. This waste is either evaporated or stored for future disposal. For every transfer out of a tank, there is a corresponding receipt of the same volume into another tank or facility. For every evaporation out of a tank there is a corresponding receipt of the more concentrated waste in the receiving tank and an increase in the condensate from the 242-A Evaporator being sent to the LERF.

An example of this type of graph (a tank fill graphic) for Tank 105-AW is shown below (Figure 6).

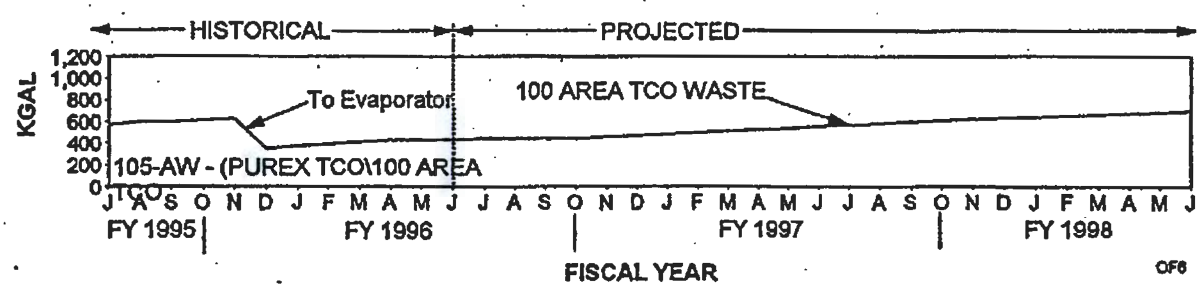


Figure 6. Tank Fill Graphic

The accuracy of this projection is directly related to the facility supplied assumptions. Some of the major assumptions are listed below:

- o Process operating schedules define the planned dates of plant operations or deactivation activities. These assumptions are consistent with the TWRS program planning. Volumes and schedules for the various Hanford facilities for the three projection cases are presented in Sections 3 and 4.

- o Plant waste generation assumptions define the volume and type of waste that will be generated by the plants. These assumptions result from an analysis of recent waste generation history and future plans specified by the plants. Most waste streams volumes are projected based on historical data and/or facility supplied operating schedules. Section 5.4 includes a comparison of actual waste receipts to the new facility waste generation targets for the period October 1996 to September 30, 1997.

Tank roles and waste routings define the use of tanks in the system. For example, a tank will be designated to act as receiver of the PUREX facility miscellaneous waste (Tank 105-AW), while other tanks will store concentrated waste.

The graphics depicted on the next few pages summarize the short range projection results for Projection Case 1. Figure 7 shows the role of each tank for a period of four years. It should be noted that if a tank has several transfers in or out of the tank in one month, no fluctuation in the tank level may appear. This is because the graphic program plots tank levels as of the last day of the month and any changes that occur during the month are not shown. The simplified routing schematic shown in Figure 8 depicts the assumptions that are made about the routing of waste from the plants to the tanks and from tanks to the facilities.

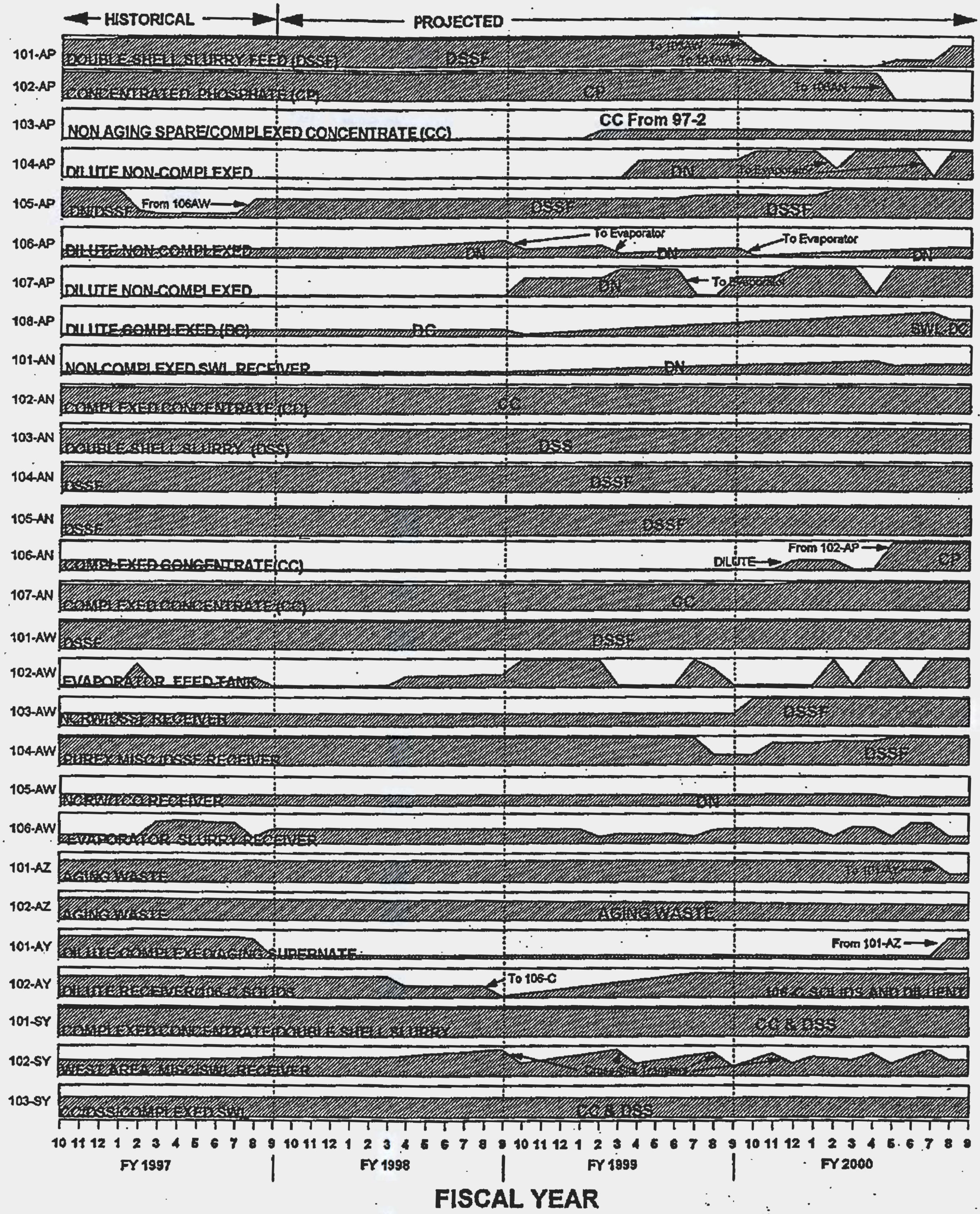


Figure 7. Tank Levels During the Short Range Projection

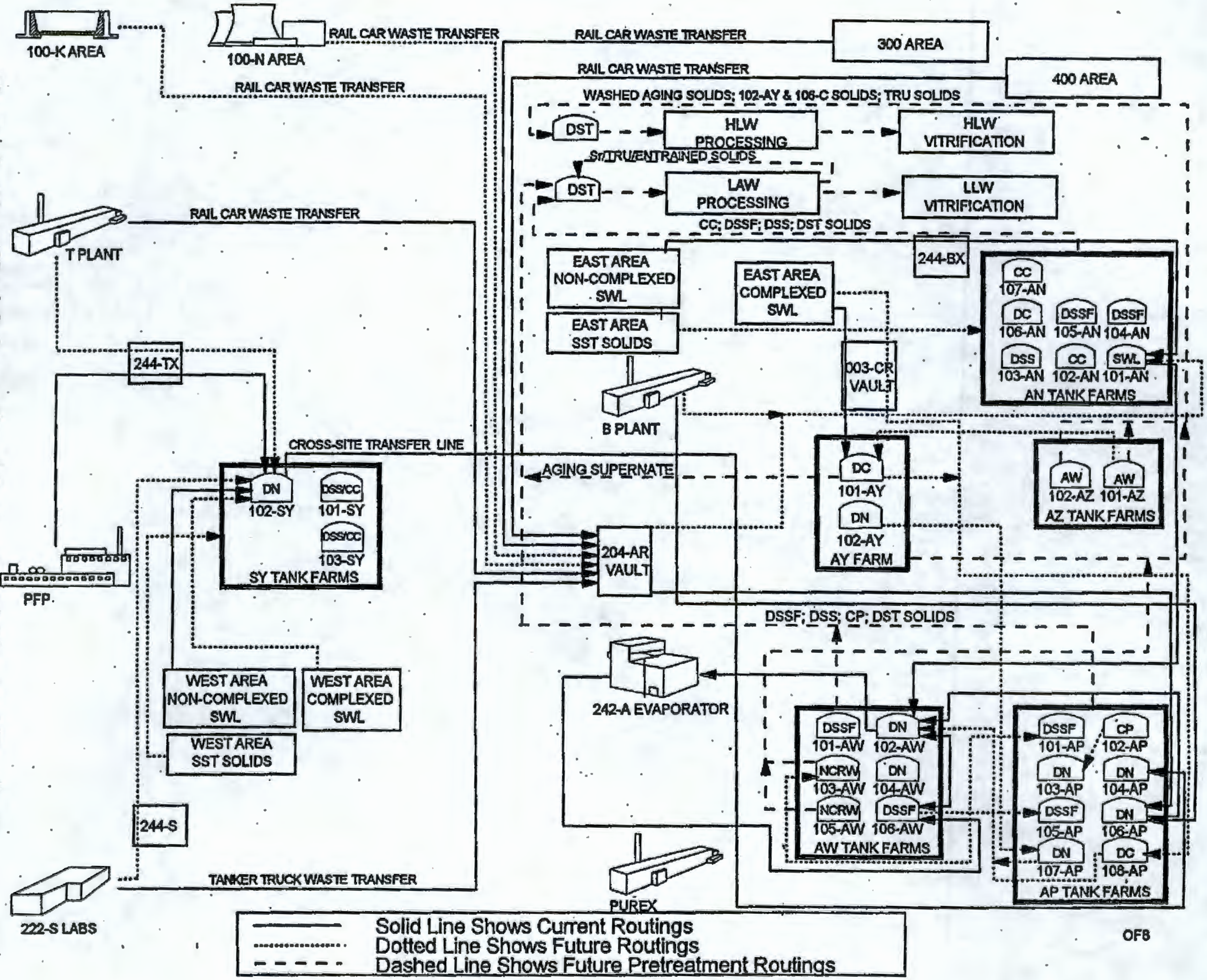


Figure 8. Simplified Schematic of Current and Planned Routings

The results of this projection are forecasts of evaporator operations, LAW processing and disposal, HLW processing and disposal, and an analysis of tank space issues for aging and non-aging waste tanks.

Evaporator WVR and LERF Condensate

Schedule and operational considerations presented in Section 3 result in the following Evaporator Waste Volume Reduction (WVR) and LERF Condensate production volumes for the Case 1 projection. The ratio of process condensate sent to LERF for every gallon of Waste Volume Reduction (WVR) for Evaporator Campaigns 94-1, 94-2, and 95-1 was 1.29, 1.24, and 1.26, respectively (Guthrie, 1996). The evaporator seal water and demister spray upgrade could reduce future process condensate production to 1.15 gallon of condensate/gallon of WVR which would lower the value used for future projections. This projection used a value of 1.20 gallon of condensate/gallon of WVR (Guthrie, 1997b) to project future condensate production recorded in Table 16. The waste sources, campaign schedule, and concentrated waste receiver tanks used in this projection are summarized Table 17.

Table 16. Evaporator WVR and LERF Additions for the Case 1 Projection

FISCAL YEAR	EVAPORATOR WVR (KGAL)	CONDENSATE TO LERF (KGAL)
1998	0	0
1999	2470	2960
2000	1630	1960
2001	1130	1360
2002	670	800
2003	1030	1240
2004	0	0
2005	640	770
2006	1710	2050
2007	590	710
2008	980	1180
2009	360	430
2010	310	370
2011	350	420
2012	330	400
2013	390	470
2014	340	410
2015	400	480

Table 17. Evaporator Campaign Schedule for the Case 1 Projection

Campaign	Start Date	Staging Tank(s)	Source	Waste Feed Type	Feed Volume (Kgal)	Receiver Tank
FY98	Cold Run. Concentrated wastes from 106-AW (Campaign 97-2) transferred to 103-AP.					
99-1	3/99	Direct to 102-AW	102-AY,106-AP,108-AP	DN	1000+	105-AP
99-2	8/99	107-AP	102-SY & 106-AP	DN-SWL & DN	1000+	105-AP
	9/99	Direct to 102-AW	104-AW	DN	700	105-AP 104-AW
00-1	3/00	104-AP	102-SY & 106-AP	DN-SWL & DN	1000+	104-AW 101-AP
00-2	6/00	107-AP	102-SY	DN-SWL & DN	1000+	101-AP
00-3	9/00	104-AP	102-SY	DC-SWL	1000+	101-AP 103-AP
	10/00	107-AP	102-SY,101-AN,105-AW	DN/DC-SWL & DN	1000+	103-AP 101-AQ*
01-1	2/01	107-AP	102-SY & 108-AP	DN/DC-SWL	1000+	101-AQ*
01-2	6/01	107-AP	106-AP & 108-AP	DN/DC-SWL	1000+	105-AN
02-1	11/01	105-AN	105-AW & 101-AN	DN & DN-SWL	1000+	105-AN

Note: Tank 101-AP is characterized and once the contents are found to be suitable, the DSSF contents are stored on top of the solids in Tanks 103-AW and 104-AW in early FY 2000. This allows Tank 101-AP to be refilled later in FY 2000. This method should allow topping off Tanks 103-AW and 104-AW with DSSF with less likelihood of producing another watch list tank than direct transfers from Tank 106-AW.
*Tank 101-AQ used to store DSSF in FY 2001 is an overflow tank.

See Figure 9 for dilute receiver tanks, evaporator WVR, and the 242-A Evaporator operating schedules for the Case 1 projection.

Based on the 50 Mgal/year treatment capacity for the ETF, the ETF should have no problem processing the projected evaporator condensates thru 2015. There should be sufficient LERF and DST space for storage of Hanford facilities generated waste and condensates between FY 1998 and the end of 2015, provided:

- the 242-A Evaporator schedule is achieved
- the amount of condensate sent to LERF does not grossly exceed the 1.2 gallon condensate/gallon WVR factor
- facilities stay within their respective generation limits
- no unexpected waste receipts are received in the DSTs

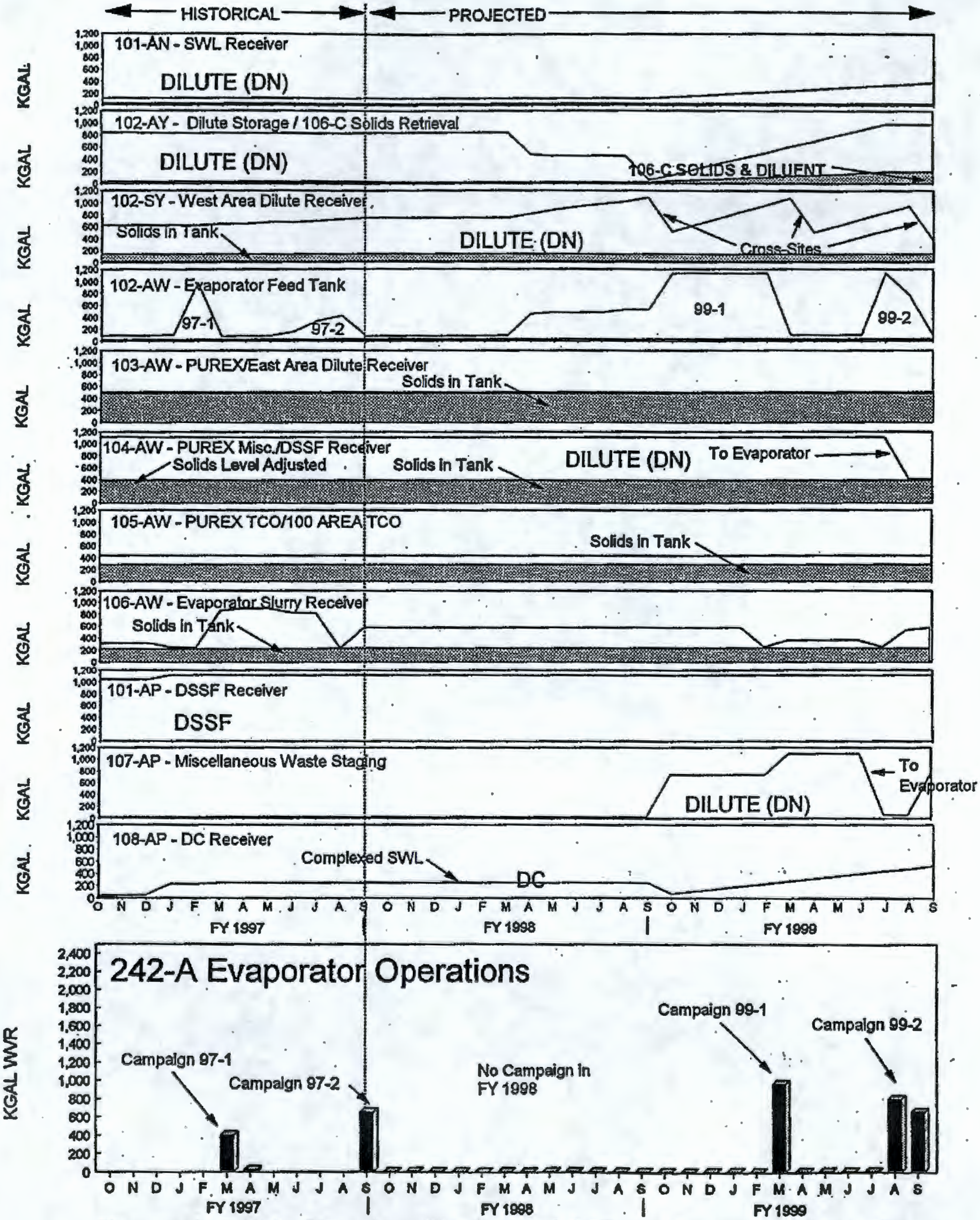


Figure 9. Dilute Receiver Tanks and 242-A Evaporator Operations

OF9

NON-AGING TANK SPACE

In later parts of the projections when tank space becomes tight due to processing needs and/or the amount of SST solids being retrieved, the evaporator is assumed to operate yearly to minimize waste storage needs and to decrease the volume of retrieved SST solids waste. Tank space pinches occurring between FY 2000 and FY 2015 (Figure 3) are caused by a combination of factors, including:

- o SWL pumping (SST stabilization) volumes pumped by the end of FY 2000 and the use of three tanks in 200 East Area to pump SWL
- o Four tanks are designated for staging wastes for Phase 1B processing--two vendor tanks (Tanks 106-AP and 108-AP) and two intermediate staging tanks (Tanks 102-AP and 104-AP)
- o The large volume of SST solids retrieved beginning in FY 2004
- o The decision not to operate the Grout Facility has eliminated an early means of freeing up DST space
- o The decision not to consolidate NCAW solids has increased the DST space needs from 2001 on
- o Overlap of retrieval of wastes from Tanks 101-SY, 102-SY, and 103-SY with the retrieval of SST solids in 200 West Area

Figures 10 through 14 show the operation of most of the DST waste tanks for the Case 1 projection.

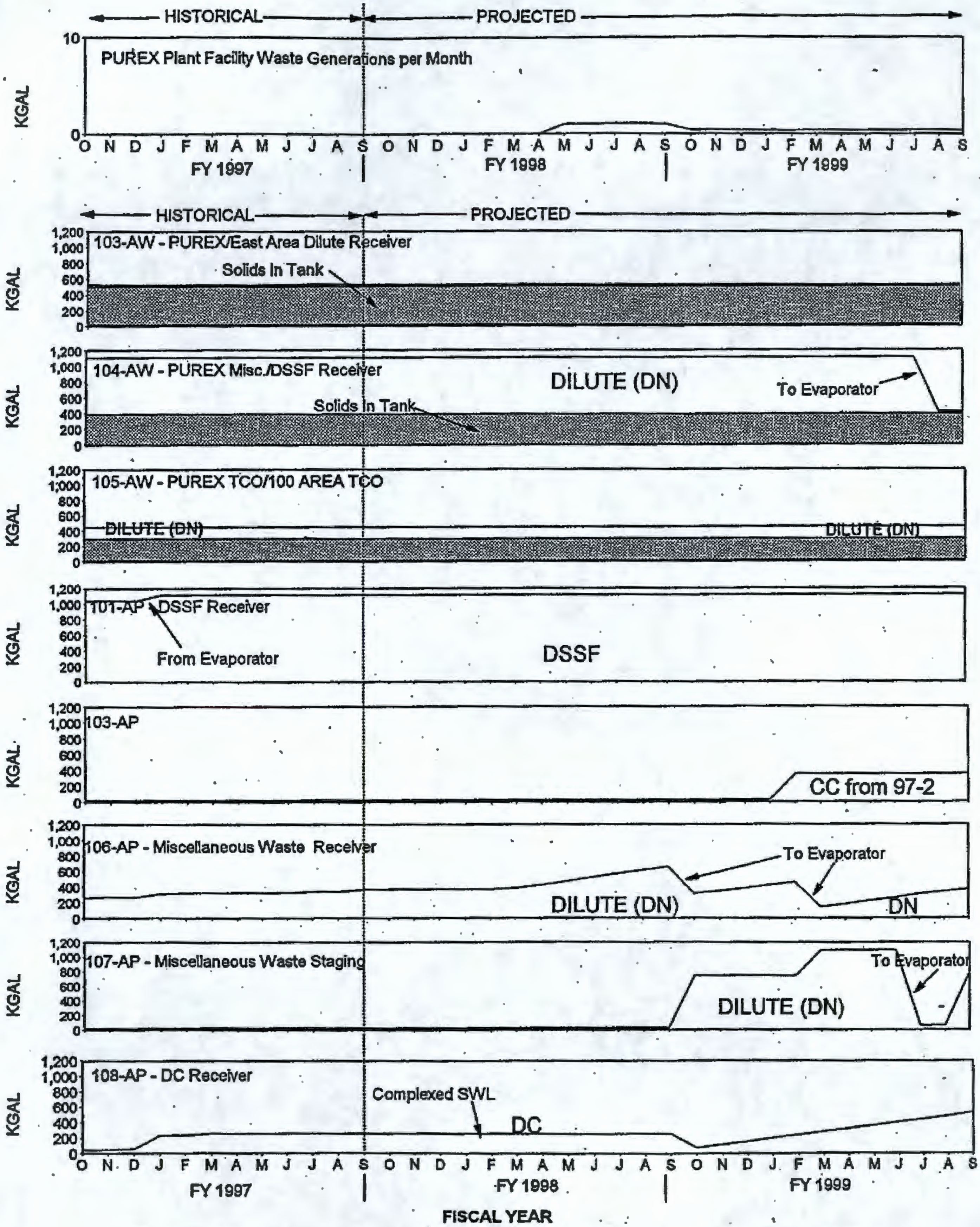


Figure 10. PUREX Facility Waste Generations and Tank Levels OF10

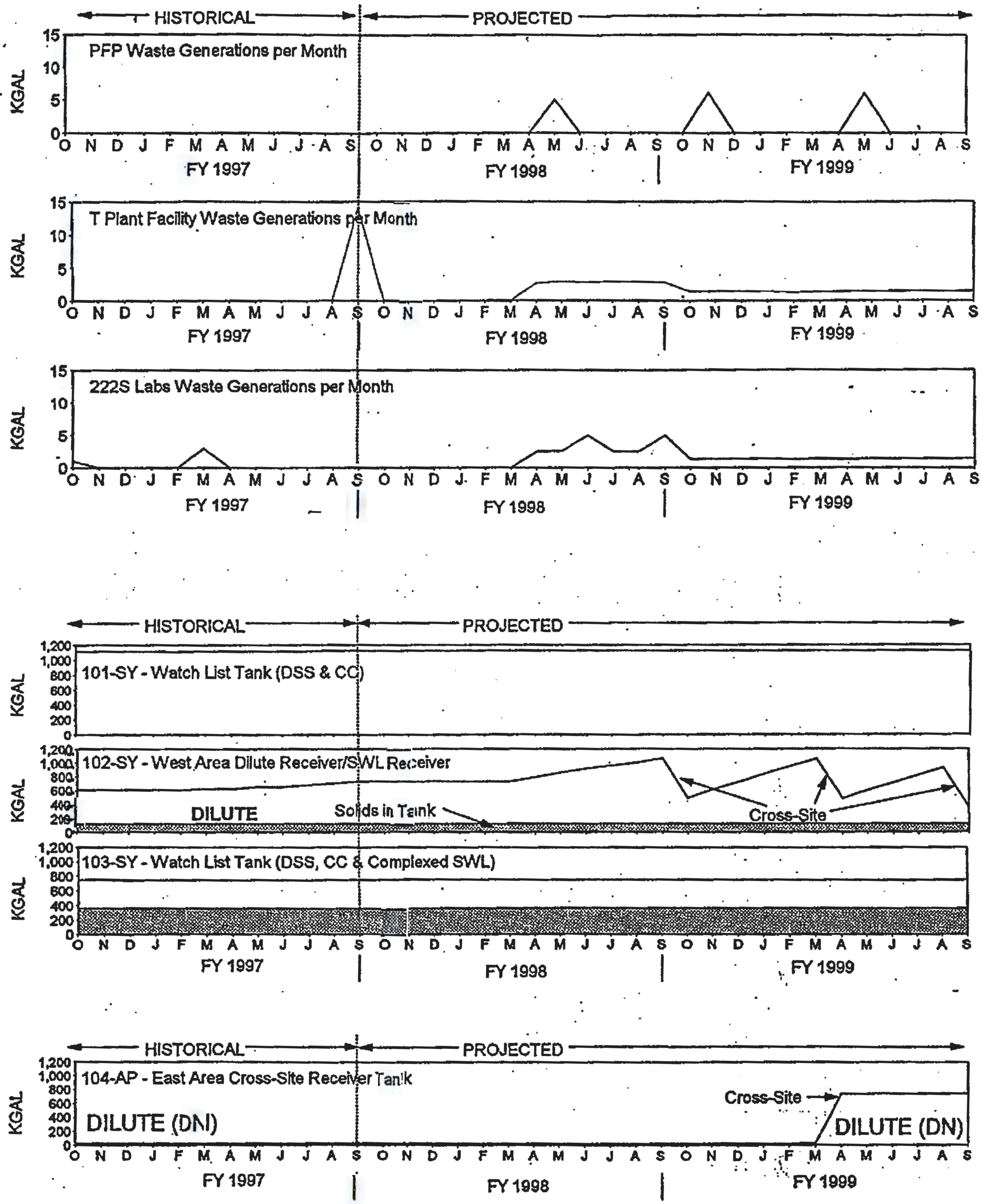
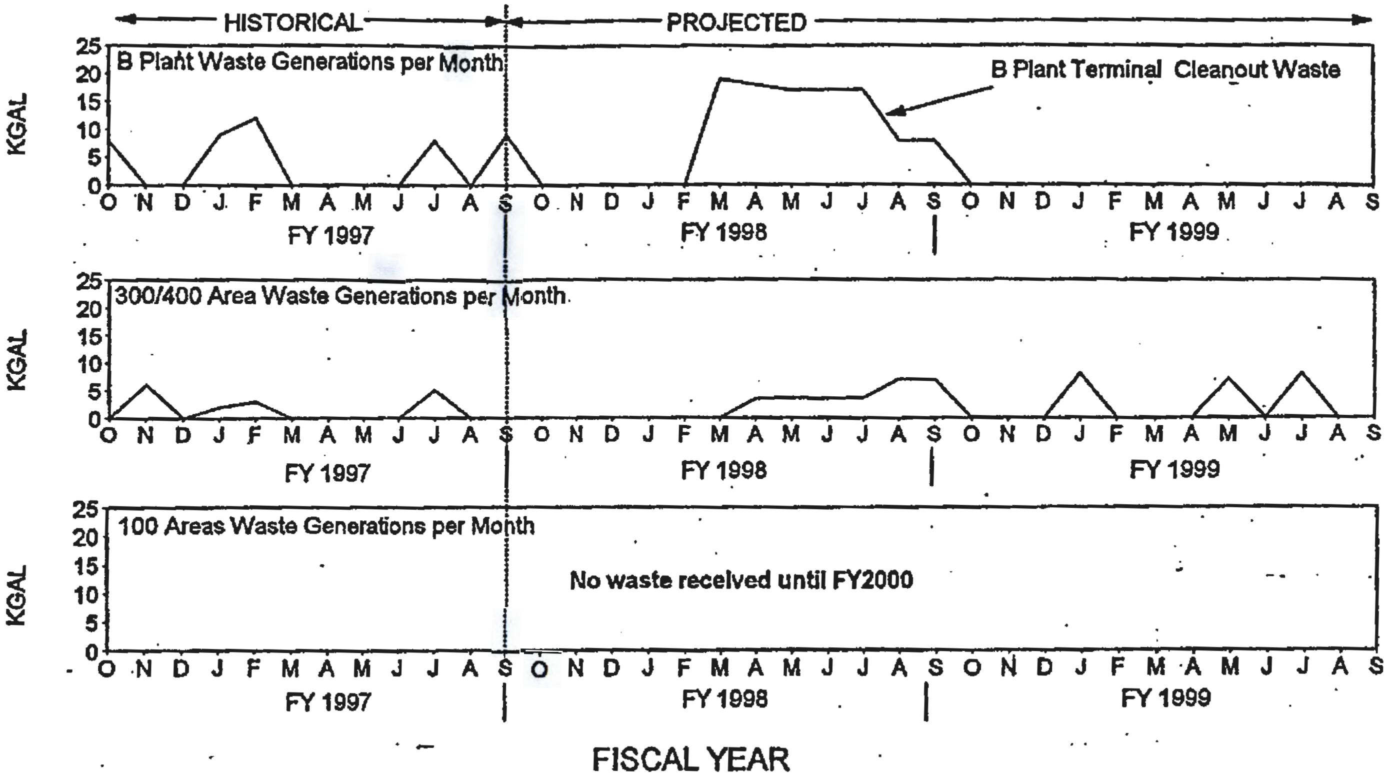


Figure 11. West Area Waste Generations and Tank Levels

OF11



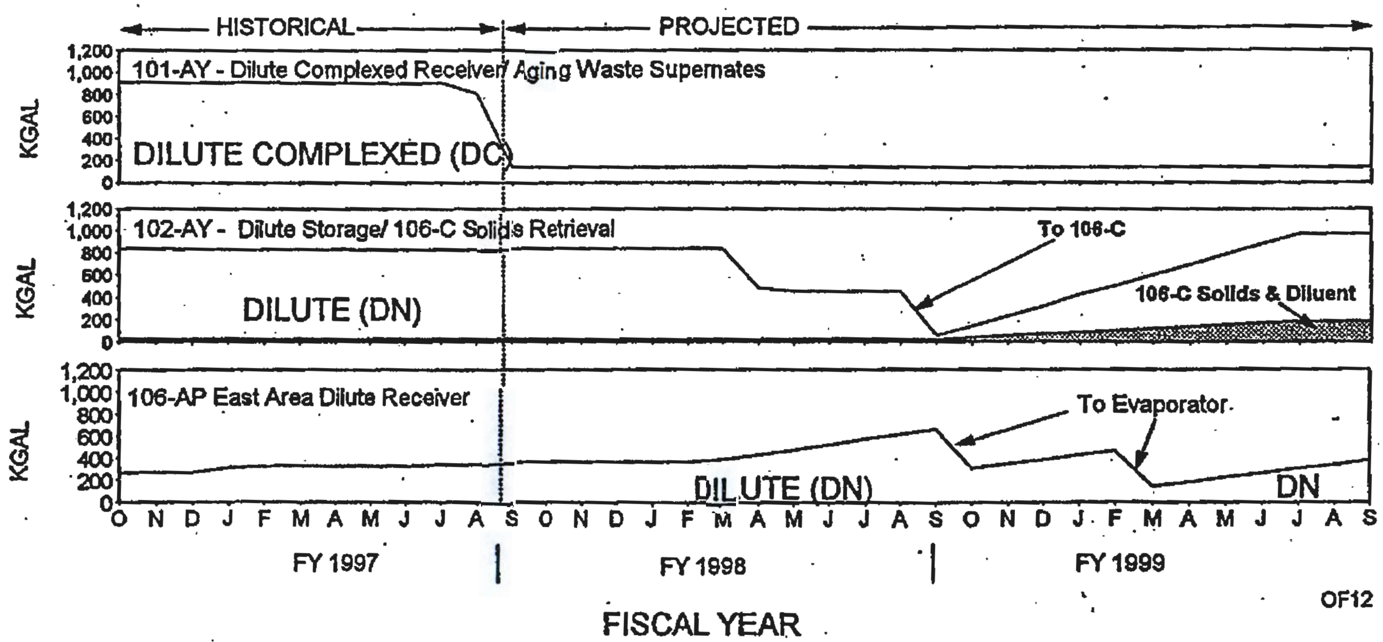


Figure 12. B Plant and Hanford Facility Waste

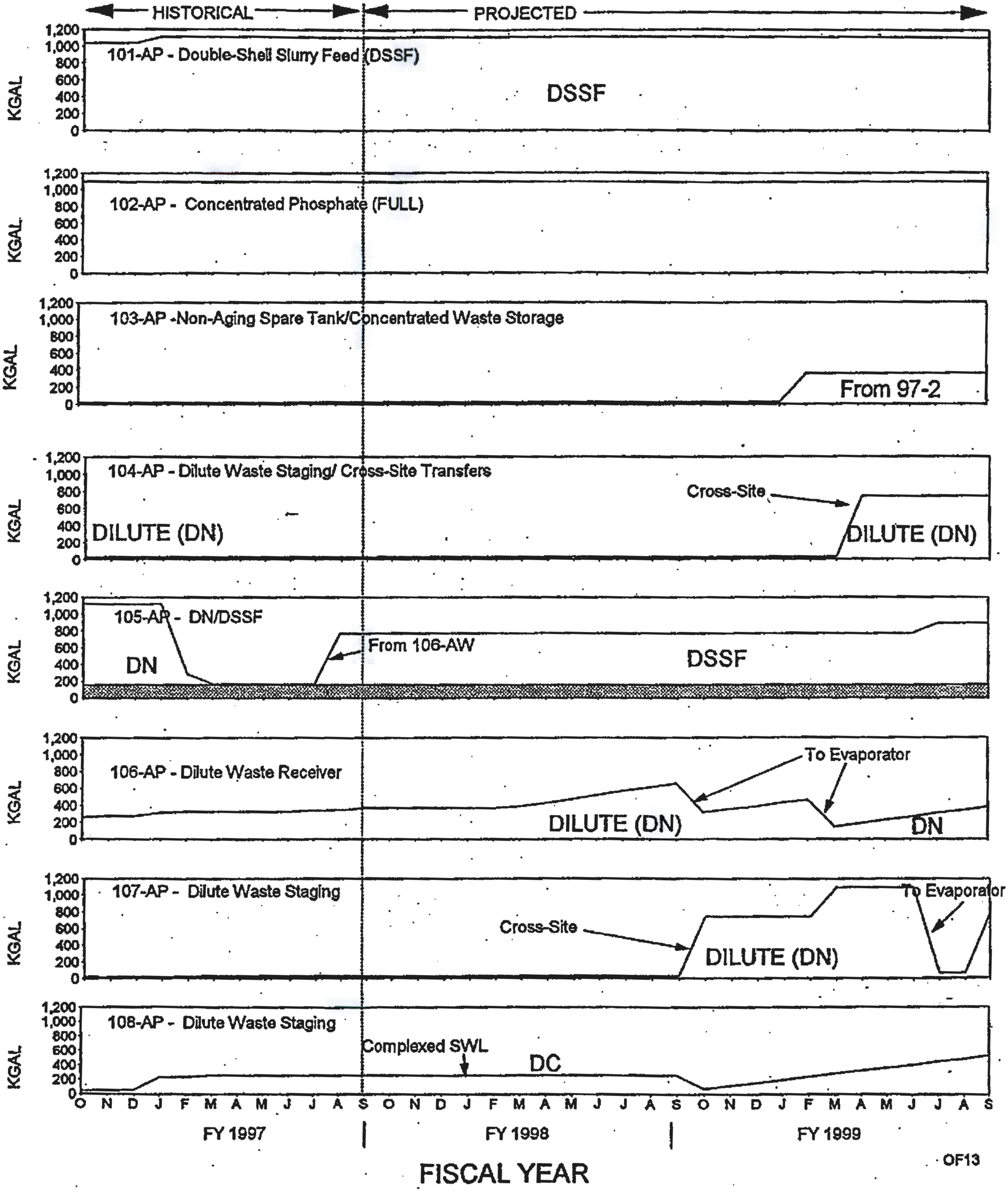


Figure 13. AP Tank Farm Levels

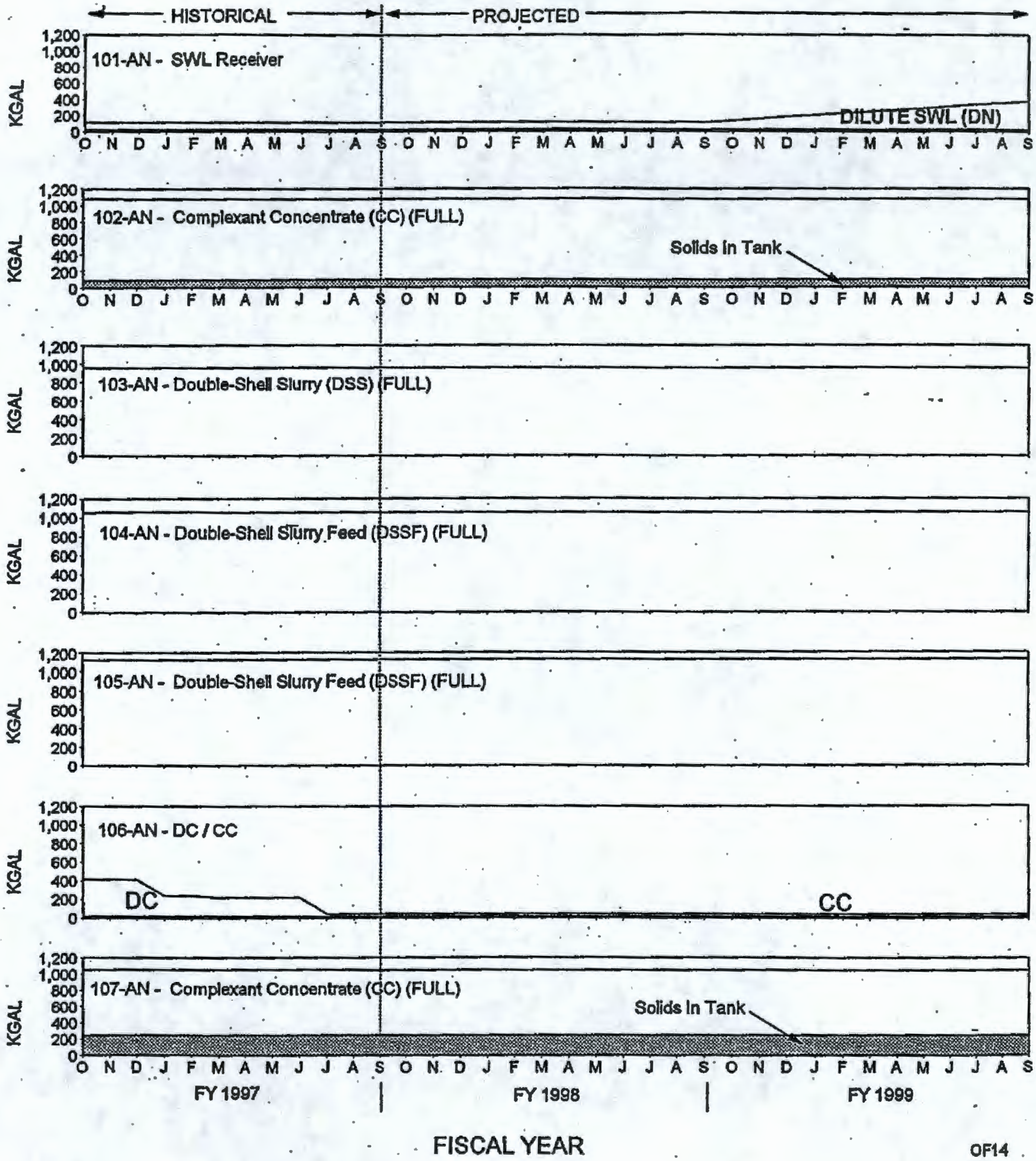


Figure 14. AN Tank Farm Levels

AGING WASTE TANK SPACE

It is assumed that the PUREX facility will not restart. With PUREX not restarting only two aging waste tanks (Tanks 101-AZ and 102-AZ) are required to store existing aging waste.

One additional aging waste tank will be required to retrieve and store the contents of Tank 106-C (a SST containing high heat waste). Waste from Tank 106-C is assumed to be retrieved to Tank 102-AY from September 1998 thru June 1999. Tank 102-AY is also used to retrieve the SST solids from Tank 104-C beginning in FY 2004.

In Revision 21 of this document, it was assumed that all NCAW solids and the 106-C solids would be combined into one aging waste tank (Tank 102-AZ) and that all NCAW supernates would be concentrated into one aging waste tank (Tank 101-AZ). Since that document was published, studies have been completed which looked at numerous sludge washing/combination options (Powell, 1996a). The alternatives for consolidating high heat sludges have been reviewed by a decision board comprised of Hanford contractor management, a DOE/RL representative, and a WDOE representative. It was concluded that consolidating all the sludges into a single tank would require modifications to the tank farm safety basis. The preliminary decision reached was not to consolidate all the high heat sludges into a single tank. The selected alternative (Alternative 8 Modified) would wash the sludges in the tanks they reside in without additional consolidation of solids. The NCAW supernates could not be combined into a single aging tank (Tank 101-AY) due to the 5 M Na limit but would be concentrated and sent to Tank 101-AY and an additional non-aging tank (Powell, 1996b). This action has increased DST needs from FY 2001 as compared to Revision 21 DST space needs.

A graph of aging waste tank space requirements as a function of time is presented in Figure 15. The uses of each individual aging waste tank for the TPA Compliant Case are shown in Figure 16.

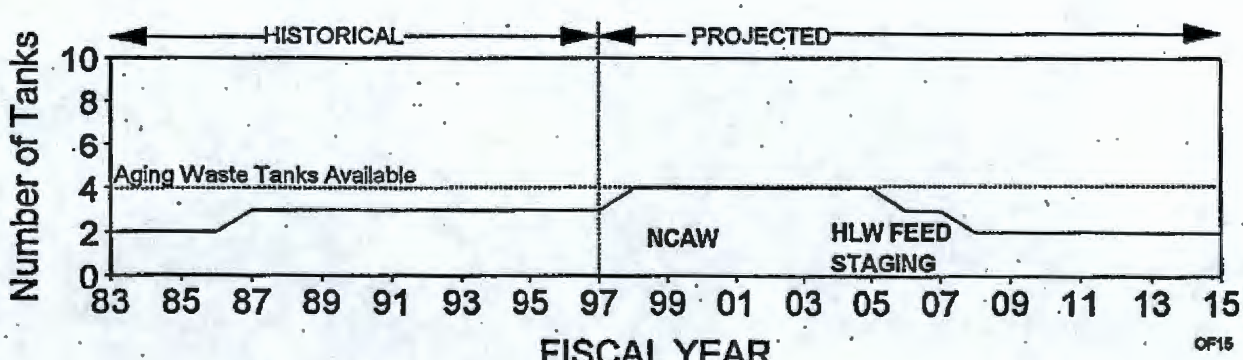


Figure 15. Aging Tank Requirements

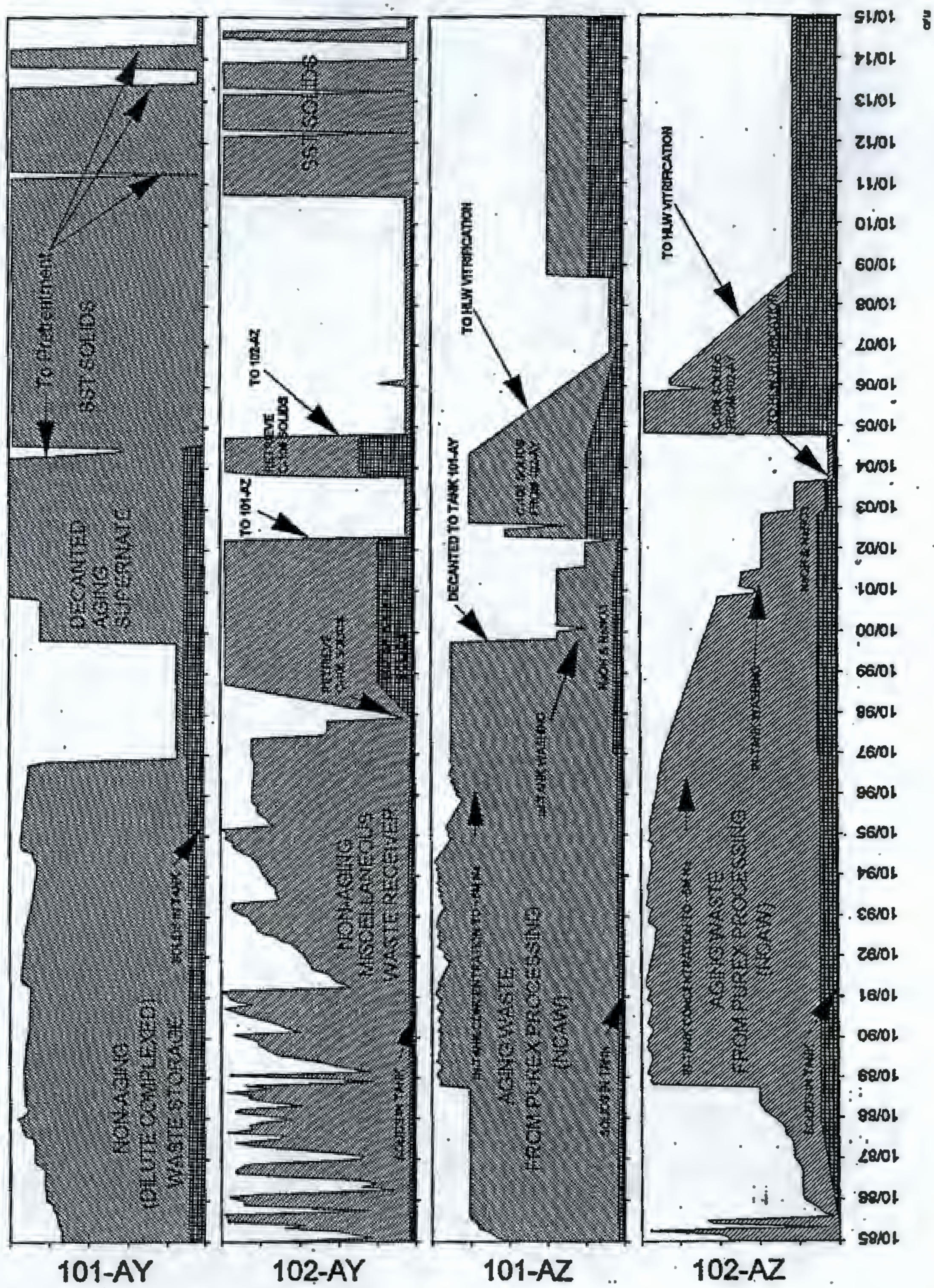


Figure 16. Aging Waste Tank Usage

5.2 Projection Case 2 Results and Conclusions

Tank space needs for the Case 2 projection are shown in Figure 17. The tank space needs for this projection clearly show that a delayed start of waste treatment will require a delay in the rate of SST solids retrieval. Tank space needs reach a maximum of 28 tanks in FY 2006 and then begin to decrease as wastes are processed. The tank space needs for this projection indicate that SST solids retrieval should not be started until approximately FY 2007. By the end of 2015, 15 tanks are being used meaning that 13 tanks are available for SST solids retrieval.

For projection Case 2, using a value of 1.20 gallon of condensate/gallon of WVR (Guthrie, 1997b) to project future condensate production results in the WVR and LERF additions reported in Table 18. The waste sources, campaign schedule, and concentrated waste receiver tanks used in the Case 2 projection are summarized Table 19.

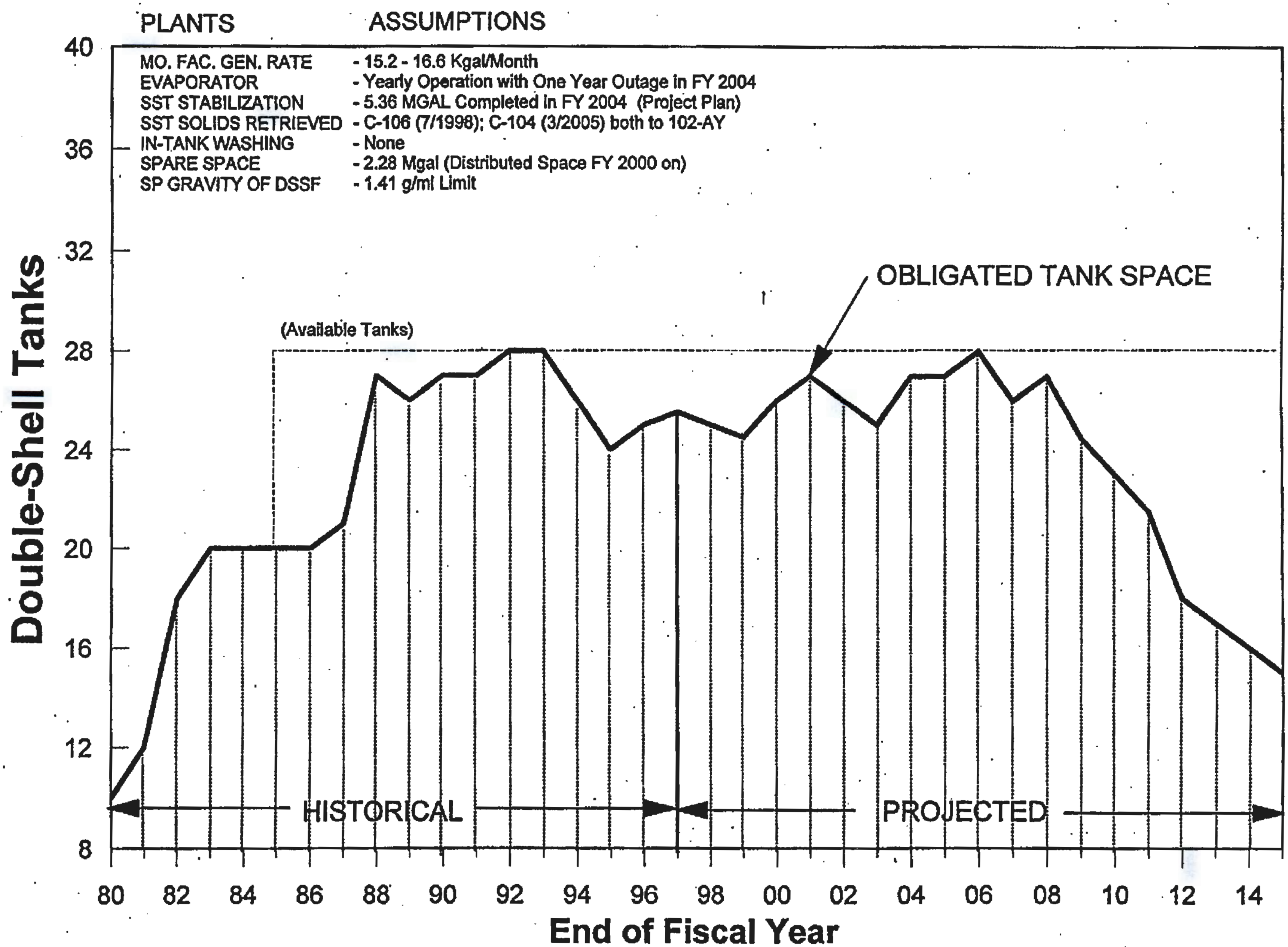


Figure 17. Double-Shell Tank Requirements for Case 2

OF17

Table 18. Evaporator WVR and LERF Additions for the Case 2 Projection

FISCAL YEAR	EVAPORATOR WVR (KGAL)	CONDENSATE TO LERF (KGAL)
1998	0	0
1999	2490	2990
2000	650	780
2001	800	960
2002	570	680
2003	1700	2040
2004	0	0
2005	1080	1300
2006	910	1090
2007	540	650
2008	640	770
2009	920	1100
2010	430	520
2011	460	550
2012	330	400
2013	390	470
2014	340	410
2015	400	480

Table 19. Evaporator Campaign Schedule for the Case 2 Projection

Campaign	Start Date	Staging Tank(s)	Source	Waste Feed Type	Feed Volume (Kgal)	Receiver Tank
FY98	Cold Run. Concentrated wastes from 106-AW (Campaign 97-2) transferred to 103-AP.					
99-1	3/99	Direct to 102-AW	102-AY,106-AP,108-AP	DN	1000+	105-AP
99-2	8/99	107-AP	102-SY & 106-AP	DN-SWL & DN	1000+	105-AP
	9/99	Direct to 102-AW	104-AW	DN	700	105-AP
00-1	7/00	104-AP	102-SY & 106-AP	DN-SWL & DN	1000+	105-AP 104-AW 101-AP
01-1	2/01	107-AP	102-SY & 101-AN	DN-SWL	1000+	101-AP
01-2	7/01	107-AP	106-AP & 108-AP	DN-SWL & DC-SWL	1000+	101-AP 101-AY
02-1	11/01	104-AP	105-AW,101-AN,102-SY	DN & DN/DC-SWL	1000+	101-AY 103-AP
03-1	11/02	104-AP	102-SY,106-AP,105-AW	DN/DC-SWL & DN	1000+	103-AP
03-2	5/03	104-AP	102-SY & 105-AW	DN/DC-SWL & DN	1000+	103-AP 101-AN
03-3	9/03	104-AP	102-SY & 105-AW	DN/DC-SWL & DN	1000+	101-AN
FY04	Evaporator outage is scheduled for FY 2004					

5.3 Projection Case 3 Results and Conclusions

Tank space needs for the Case 3 projection are shown in Figure 18. The tank space needs for this projection clearly show that a delayed start of waste treatment will require a delay in the rate of SST solids retrieval. Tank space requirements exceed available space by the end of FY 2004 due to SST solids retrieval. The tank space needs for this projection clearly show that SST solids retrieval should not be started until approximately FY 2007 and that the rate of retrieval would have to be reduced to match the slower waste treatment schedule built into this projection.

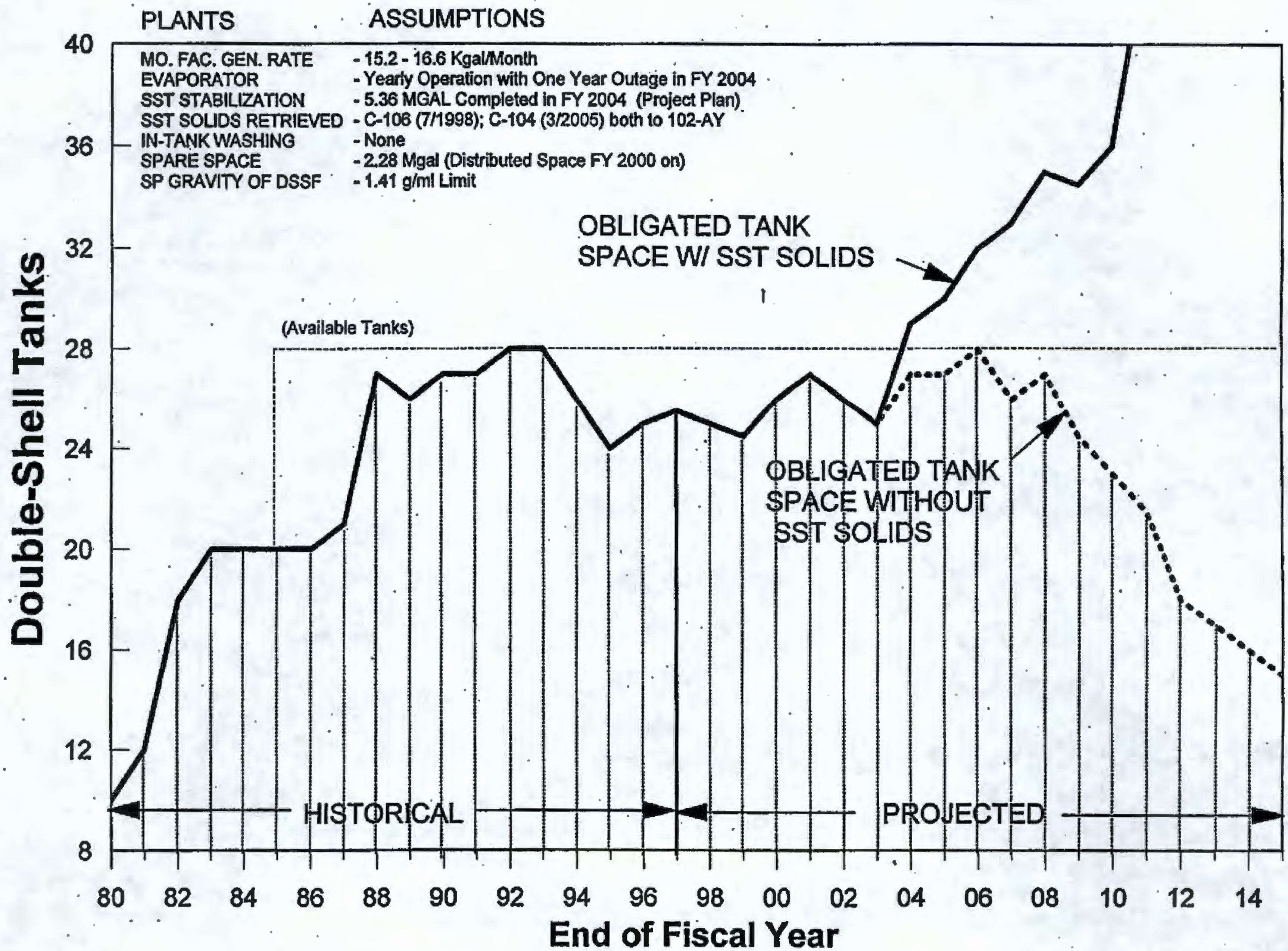


Figure 18. Double-Shell Tank Requirements for Case 3

OF18

5.4 Actual Waste Generation Compared to Management Limits

During the Tank Space Management Board (TSMB) meeting on August 7, 1991, the need to establish new facility waste generation limits was discussed with the Hanford facility representatives based on additional delays in the 242-A Evaporator restart. A new total monthly waste generation rate of 64 Kgal/month was adopted based on: discussions with facility representatives, the average monthly waste generation rate for each facility during FY 1991, and the need to provide contingency space for potential delays in the 242-A Evaporator restart.

Facility generation limits were not established for high priority waste generations, which were assigned to "Priority Space". These generations included the PFP stabilization campaign (safety), SWL pumping (TPA milestone), and the 242-A Evaporator (space necessary for the mini-run and restart).

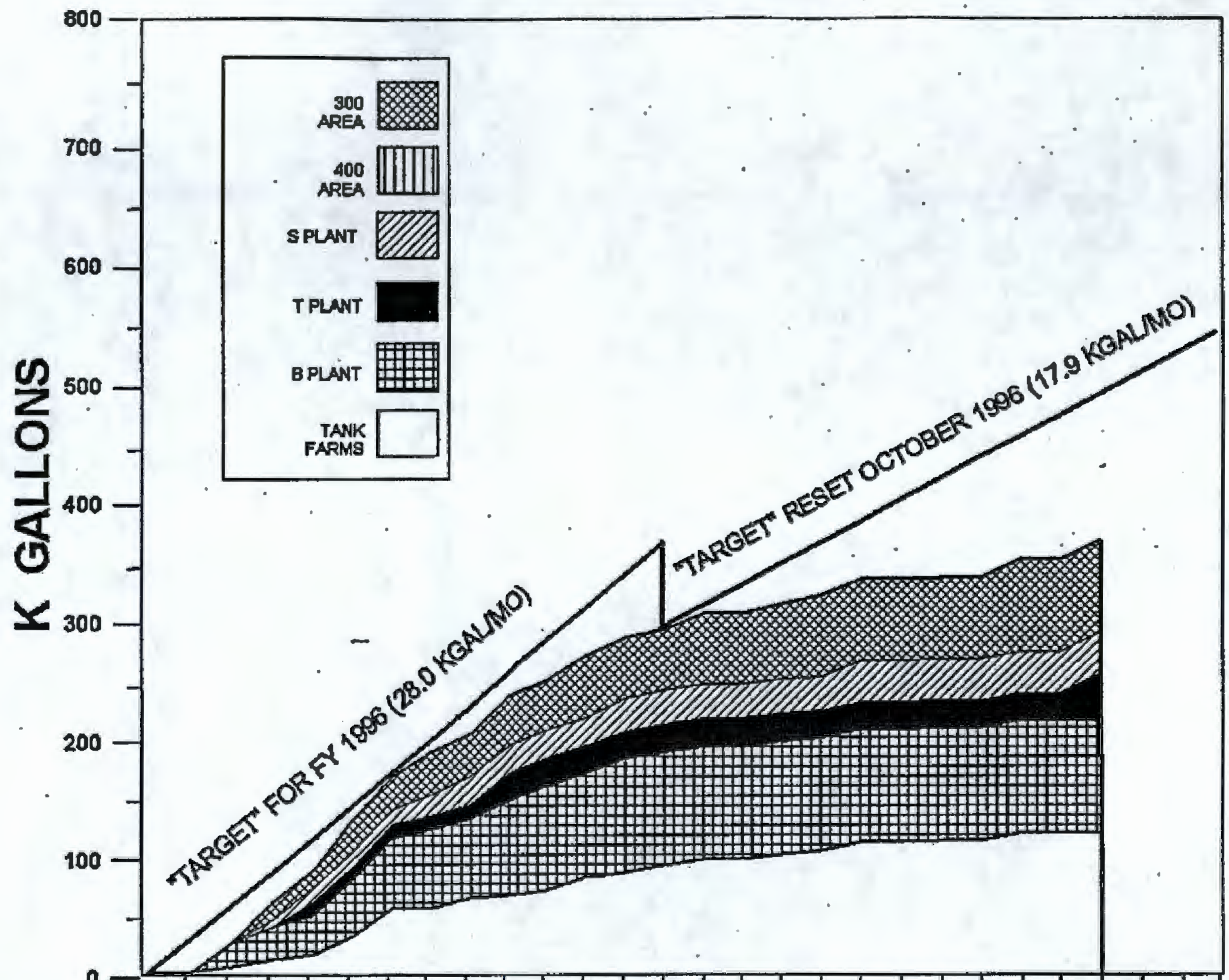
New average monthly waste generation targets have been established for this projection with waste generations being reduced by the facilities (references and discussion in Section 3). Table 20 presents a comparison of the previous limits established for each facility, the newly established target rates for this projection, and the actual average monthly waste generation rate (Kgal/month) for the period October 1996 through September 30, 1997. B Plant is currently in a terminal cleanout (TCO) mode and therefore does not have a monthly target waste generation for miscellaneous waste generations for Rev. 24. TCO at the PUREX facility was completed last year but the facility will be sending 5 Kgal/year of collected condensate to Tank Farms.

Table 20. Comparison of Average Monthly Waste Generation Rates (Kgal/month)

FACILITY	64 KGAL/MONTH MANAGEMENT LIMIT FROM OWVP REV. 20	FACILITY TARGET FOR REV. 23 #	AVERAGE MONTHLY FACILITY GENERATIONS (10/96 - 9/97)
TANK FARMS	10.0	10.0	2.7
B PLANT	23.0	N/A-TCO MODE	N/A-TCO MODE
WESF	N/A	1.7	With B PLANT
PUREX	N/A	0.4	N/A-TCO MODE
PFP	N/A	0.4	N/A
T PLANT	6.0	1.4	1.4
S PLANT	5.0	2.1	0.6
300 AREA	5.0	4.2	2.2
400 AREA	0.0	0.2	0.0
TOTAL	64.0	20.4	6.9

Monthly Totals do not Include Terminal Clean-out Volumes or SWL Pumping

Due to the commendable efforts by the Hanford facilities, all waste generators are at or below their new waste generation target for the period October 1996 through September 30, 1997. A comparison of the volumes of waste entering the DST tank space for that time period is compared graphically to the various targets or projected generations in Figures 19-22.



	TARGET	10/95	11/95	12/95	1/96	2/96	3/96	4/96	5/96	6/96	7/96	8/96	9/96	10/96	11/96	12/96	1/97	2/97	3/97	4/97	5/97	6/97	7/97	8/97	9/97	10/97	11/97	12/97
300 AREA	2.1	0	0	15	0	13	0	8	0	6	0	10	0	0	8	0	4	5	0	0	0	0	9	0	0			
400 AREA	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
S PLANT	2.1	0	0	7	5	0	0	6	6	0	0	0	4	1	0	0	0	0	6	0	0	0	0	0	0			
T PLANT	1.4	0	0	0	12	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17			
B PLANT	**	0	21	7	6	14	12	7	0	12	9	0	7	**	**	**	**	**	**	**	**	**	**	**	**			
TANK FARMS	16.0	1	4	6	4	16	24	0	9	2	4	11	5	6	5	0	4	3	7	0	1	0	6	0	0			
TOTAL	17.9	1	25	35	27	43	36	21	15	32	13	21	16	7	13	0	8	8	13	0	1	0	15	8	17			

NOTE: THIS GRAPHIC DEPICTS CONTRIBUTIONS FROM FACILITY GENERATIONS; TERMINAL CLEAN-OUT AND SWL PUMPING IS NOT SHOWN
** B-PLANT LISTED UNDER TERMINAL CLEAN-OUT FROM 10/96.

Figure 19. Comparison of Facility Generations to "TARGET"

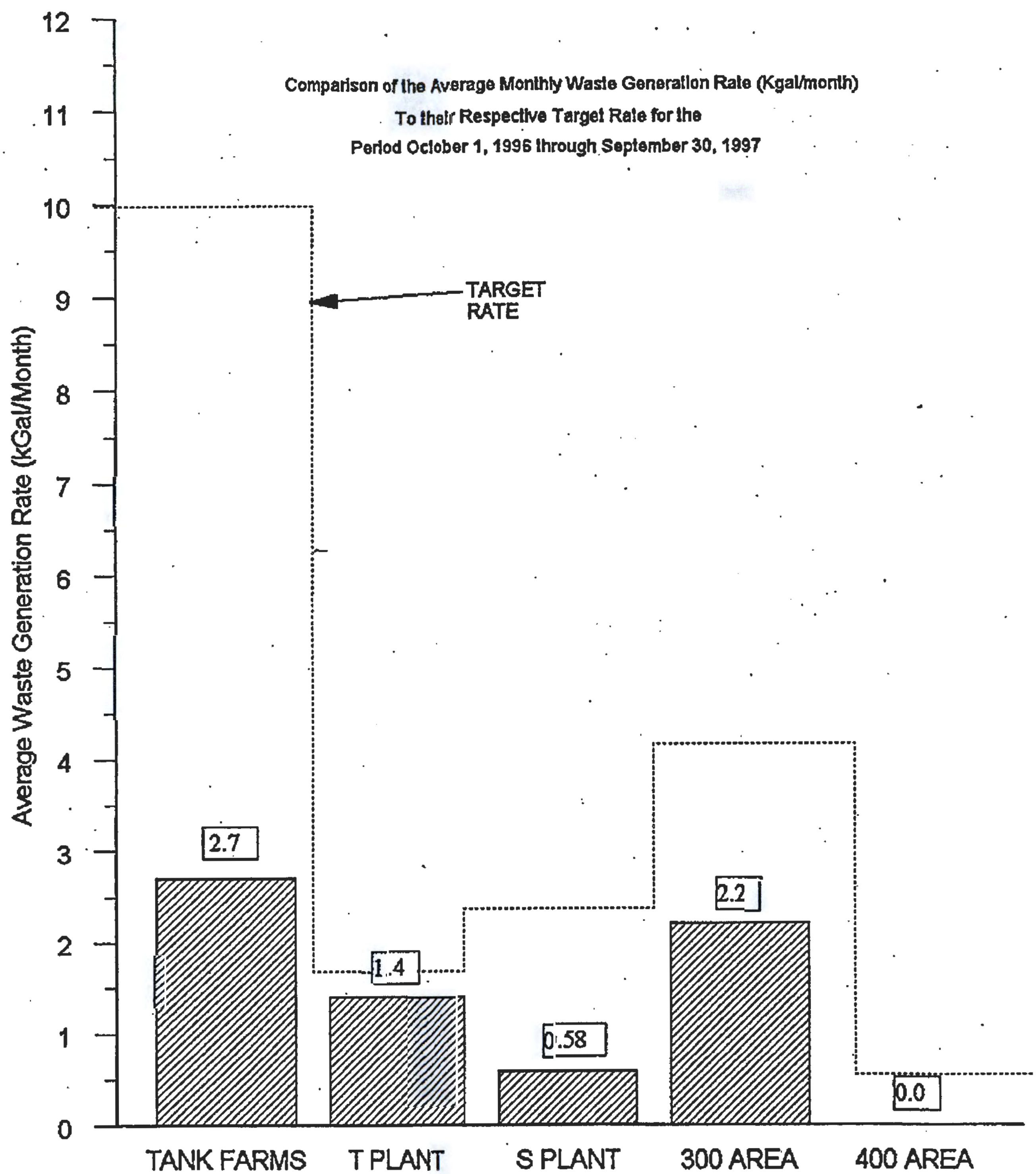
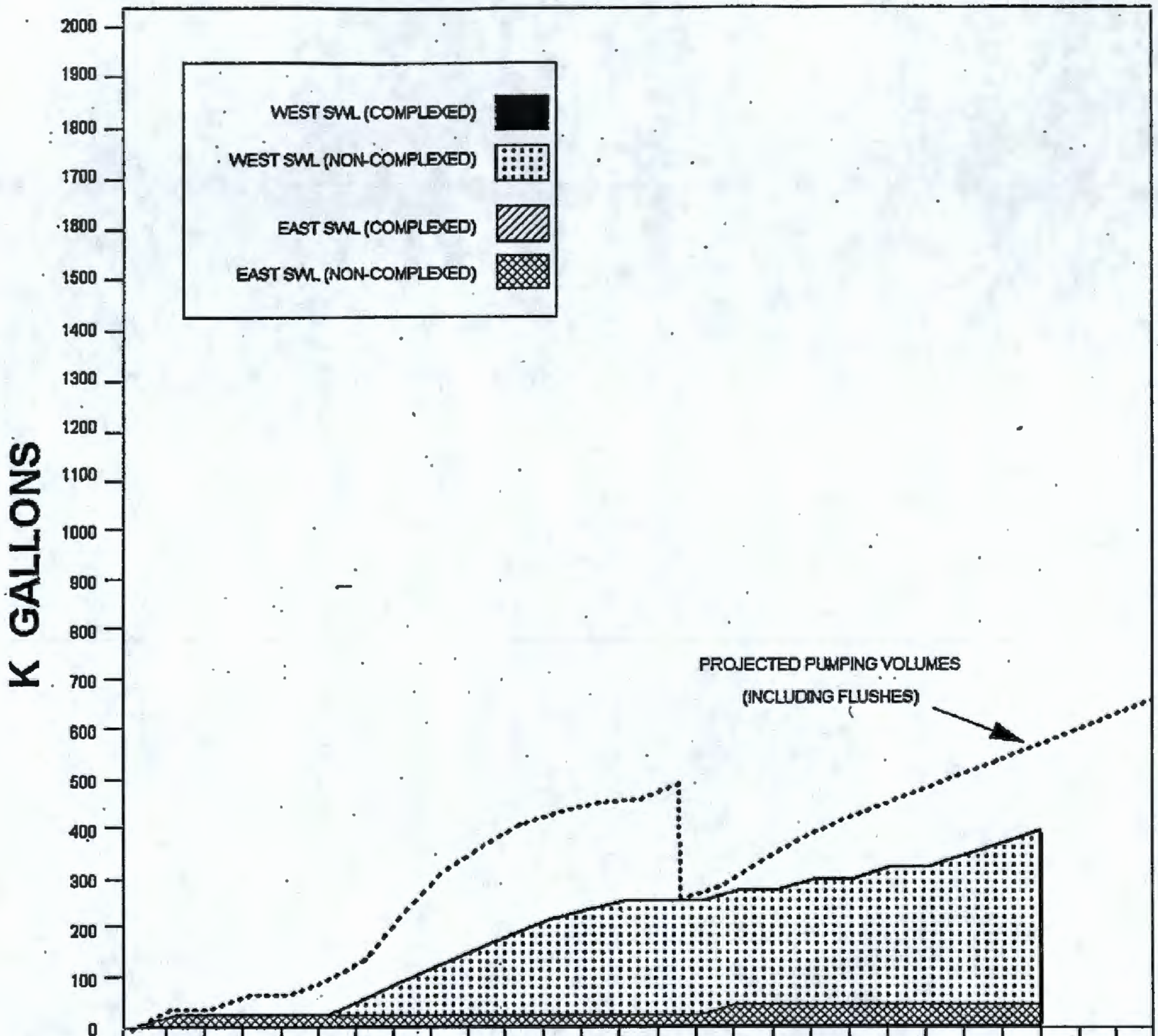


Figure 20. Comparison of Monthly Average Waste Generation To Target Rate



	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
WEST SWL (DC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
WEST SWL (DN)	0	0	0	0	0	35	35	33	32	32	30	31	17	0	0	0	0	23	0	24	0	25	24	27			
EAST SWL (DC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
EAST SWL (DN)	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0			

FY 1996 FY 1997

Figure 21. Contributions From Salt Well Liquid Pumping

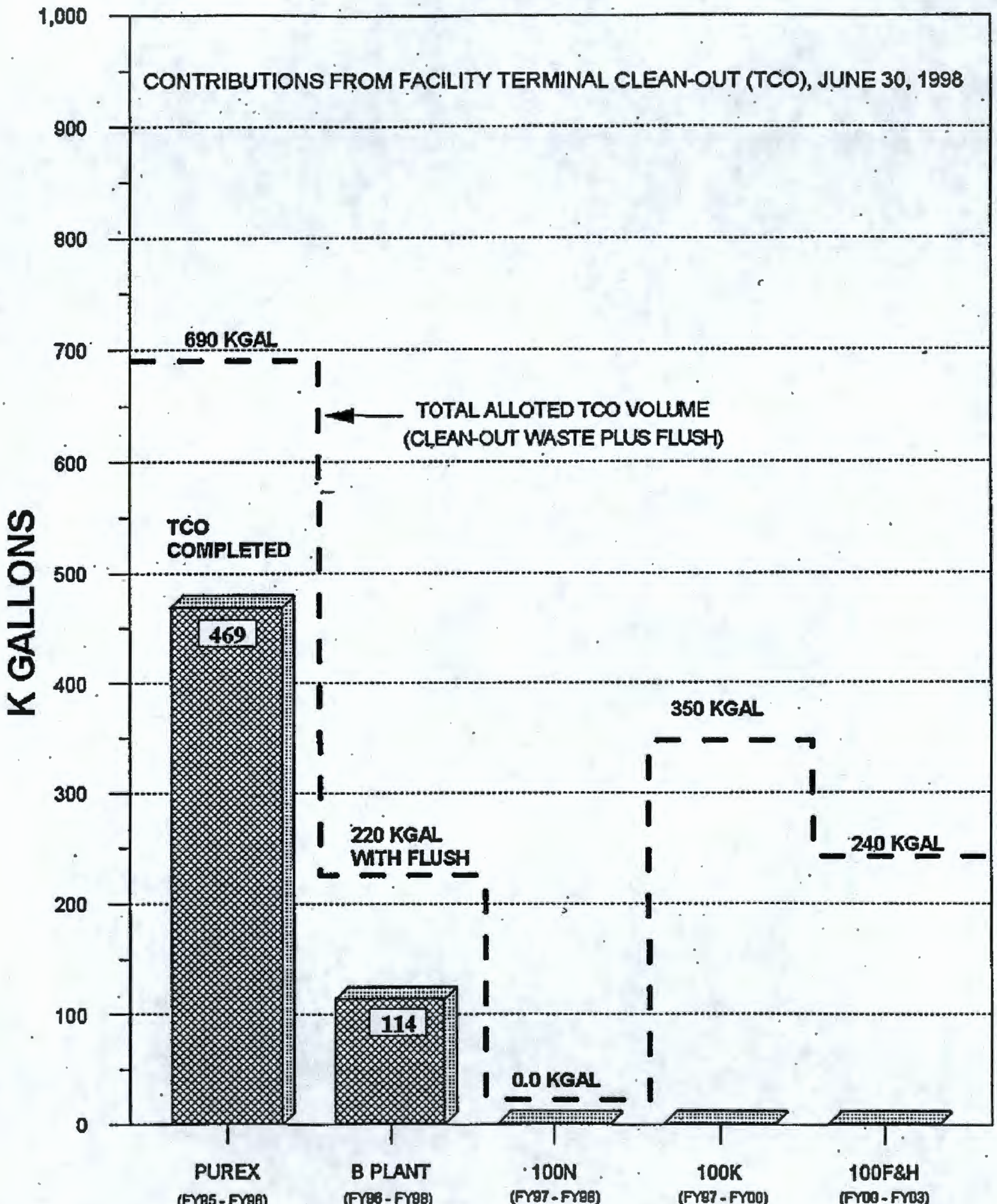


Figure 22. Contributions From TCO (June 30, 1998)

6.0 SPACE SAVING ALTERNATIVES

In the near term, space saving alternatives include waste minimization, continued availability of the 242-A Evaporator, LERF availability, and the operation of the ETF. These alternatives must be considered because new inputs to the system may develop (e.g., unexpected new waste streams or a leaking SST or DST).

Should a tank space shortage develop in the period 1998 through 2015, response to the shortage for the TPA Compliant Case must be in one of three areas. The inflows to the system must be reduced, the outflows to the system must be increased (or started earlier), or the available tank space increased. Inflows to the system include miscellaneous facility waste generations, TCO wastes, in-tank washing, dilution of Tanks 101-SY and 103-SY (for processing), processing, SWL pumping, and SST solids retrieval. Outflows include the 242-A Evaporator and waste disposal (processing and vitrification). Increasing the tank space available could be done by building more tanks (a six to eight year task), mixing segregated waste types (which would gain about half a million gallons of space), or operating without reserved spare tank space. A cost/benefit analysis needs to be completed to determine the best alternative.

In addition to minimizing waste generations, other actions could be pursued. The list below includes many actions which can result in tank space savings or economization, and can serve as a starting point in a tank space optimization program.

<u>PUREX Facility</u>

- TCO of PUREX was completed in FY 1997. Therefore, waste reductions for PUREX will not be a viable option.

<u>B Plant</u>

- Continue to reduce waste being generated at B Plant
- Reduce or eliminate flush volumes following low-level waste transfers to DSTs

<u>Plutonium Finishing Plant</u>

- Continue to reduce waste being generated at PFP (only 27 Kgal of total waste are scheduled to be generated from FY 1998-2006

6.0 SPACE SAVING ALTERNATIVES (CONTINUED)

Tank Farms

- Continue to reduce waste being added to DSTs
- Continue waste accountability and minimization controls
- Develop a total waste cutoff plan
- Increase the 5 M Na limitation on aging waste tanks
- Use dilute waste for retrieval, air lift circulator flushes, line flushes, etc.
- Increase the WVR of the 242-A Evaporator
- Accelerate plans to consolidate solids from Tanks 102-SY into Tank 105-AW
- Delay SWL pumping
- Build new tanks
- Accept loss of waste segregation (used as a last resort)
- Store facility generated waste in designated "spare tank space" (used in an extreme emergency)
- Improve efficiency of the 242-A Evaporator
- Solidify treated waste and dispose of as low level waste in burial grounds
- Consolidate NCAW and Tank 106-C solids in one aging tank with one additional aging tank being used to combine NCAW supernates (requires modification of safety basis).
- Increase the heat limit on non-aging DSTs to allow either the Tank 106-C wastes or the supernate from Tank 101-AZ to be stored in a non-aging DSTs if the in-tank washing consolidations are not allowed
- Concentrate DSSF to Double-Shell Slurry (DSS). Experience with Tank 101-SY makes this alternative highly unlikely.
- Store waste in single-shell tanks (used in an extreme emergency; would require approval by DOE, EPA, and Ecology)
- Store waste in facility storage tanks or portable tanks such as railcars (used in an extreme emergency; total space available is small compared to the contents of a DST)
- Upgrade single-shell tanks by adding a liner to allow storage of waste

Grout

- Reinstate the Grout Disposal Program (unlikely to occur; considered an emergency option only)
- Grout the existing waste in Tanks 102-AP and 101-AW

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APPENDIX

APPENDIX. Acronyms

ASD - ammonia scrubber distillate from
ASF - ammonia scrubber feed from
AW - aging waste, also called NCAW
BCP - B Plant process condensate
CC - complexant concentrate waste
CP - concentrated phosphate waste
DC - dilute complexed waste
DCRT - doubly contained receiver tank
DN - dilute non-complexed waste
DOE - U.S. Department of Energy
DP - dilute phosphate waste
DSS - double-shell slurry (most concentrated double-shell tank waste)
DSSF - double-shell slurry feed
DST - double-shell tank
EIS - Environmental Impact Study
FFTF - Fast Flux Test Facility
FSAR - Facility Safety Analysis Report
FY - fiscal year
GTF - Grout Treatment Facility
HFW - Hanford facility waste (waste produced at 100, 300, 400 areas)
HLW - High Level Waste
IPM - Initial Pretreatment Module
IX - ion-exchange
KGAL - kilogallon (1000 gallons)
LERF - Liquid Effluent Retention Facility
LETF - Liquid Effluent Treatment Facility
LAW - Low Activity Waste
MOTU - metric tons of uranium
NCAW - neutralized current acid waste
NCRW - neutralized cladding removal waste
OWVP - Operational Waste Volume Projection
NEA - National Environmental Policy Act
NSF - New Pretreatment Facility
NEV - New Pretreatment Vault
NVOL - Non-volatile oxide less sodium and silicon
PAD - process distillate discharge from PUREX
PFP - Plutonium Finishing Plant
PRF - Plutonium Reclamation Facility
PAW - phosphate/sulfate waste
PHMC - Project Hanford Management Contractor
PUREX - Plutonium-Uranium Extraction
RMC - Remote Mechanical C Line
SpG - Specific Gravity
SST - single-shell tank
SWL - salt well liquid
TCO - terminal clean-out
TOE - total operating efficiency
TPA - Tri-Party Agreement
TRU - transuranic
TRUEX - Transuranic Extraction Process
TSMB - Tank Space Management Board
UO_3 - Uranium Oxide Facility
WSCF - Waste Sampling and Characterization Facility
WVR - waste volume reduction

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